JOURNAL OF GAS LIGHTING, WATER SUPPLY, &c.

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EDITORIAL NOTES—GAS, &c.

The Supply of Shareholders' Lists.

WE are coming to closer quarters now, and hope there will be no evasion, in putting to a test the question of the right of company promoters or their deputies—by the simple expedient of purchasing a few pounds' worth of shares or stock in a Company—insisting on the supply of the names and addresses of the shareholders under section 10 of the Companies Clauses Act, 1845; and there are a few points in connection with the matter with which it will be useful to present readers, without comment at the moment, now that the matter is before the Courts. Readers will remember that in the "JOURNAL" for Sept. 22, Gas Company directors and officials were strongly counselled not to be bullied into the granting to company promoters or their agents of these lists by any menaces of legal proceedings, but, in the interests of their *bonâ fide* shareholders and proprietors, to resist the application to the utmost—that is to say, until ordered, if so ordered, by the Courts to comply. If there is no collapse now, the question will be fought out by the Gaslight and Coke Company; and, if further pressed, by the Chigwell, Loughton, and Woodford Gas Company.

The attention of readers is invited to the reports of the commencing proceedings in our "Legal Intelligence" this week. Mr. Davies, whose association with the promotions of No. 99, Cannon Street, in various capacities, such as Secretary, Director, and so forth, has been mentioned on previous occasions in our columns, is the applicant in both cases for either a list or a revised list of shareholders; and both the Companies have declined to supply him. The first legal brush in open Court has been with the Chigwell, Loughton, and Woodford Company. Mr. F. Smallbone is the delinquent named, as the chief officer of the Company, through his non-compliance (acting with the consent of his Directors) with the much-pressed application. In this instance, the proceedings in the attempt to enforce compliance, were taken in the Police Court at Stratford. But after an argument (which readers will find peculiarly interesting) by Mr. Courthope-Munroe, for the Company, the Court agreed with him that they had no jurisdiction in the matter; so that if Mr. Davies cares to pursue this particular application, his next step will be to move for a *mandamus* in the High Court. One incident in the case at Stratford was that (admittedly to the surprise of his own Counsel, who was only informed of the circumstance as the case was called on) Mr. Davies could not put in an appearance through illness; but, as the Court had no jurisdiction, his absence on this occasion did not matter. It is hoped, however, that the applicant will have fully recovered by Dec. 3, as his presence will be required in the High Court on that date. It will be seen, from our legal reports, that Mr. Justice Warrington has, on the application of Mr. R. J. Neville, paved the way for the Gaslight and Coke Company to satisfy a rather natural desire on their part to interrogate Mr. Davies in open Court. Apparently, they are not of opinion that it will be to the interests of the proprietors in the Company that the Court should insist on compliance with the request of Mr. Davies. Therefore, it is hoped that nothing will intervene to prevent the Company gratifying their desire.

Meantime, in various directions, there have been fresh transfers of a few pounds worth of shares to representative acquirers of little holdings on behalf of gas company promoters. All companies, who have had such transfers, will do well for the present, anyway until the settlement of the pending legal proceedings, to decline applications for lists of shareholders, whether by company promoters, their dependents, or deputies. From whatever source the applications are made, it is a duty Directors owe to their shareholders to ascertain in each case whether the application is made in the interests of their constituents or for any purpose associated with the undertaking; and, if it is not, to take, if necessary, the direction of the Courts in the matter.

The New Coalite Process.

THE efforts of the Publicity Department of the British Coalite Company have culminated during the past week in an article-advertisement in "The Times" of the 27th ult., and an article signed "W. Watson" in the "Financial News" of the same date. The articles continue the story of the progress of Coalite, begun in the same papers a week earlier, and written from the standpoint the Company are anxious the public should accept as correct. This standpoint does not happen to coincide with ours; and we are presumptuous enough to believe that our views on the merits and prospects of a process for the carbonization of coal are more likely to prove correct than those emanating from the electrical engineers and heterogeneous advisers and guides of the Company who are exploiting the process.

The articles referred to speak scornfully of gas undertakings and their responsible officers, because the latter have so far refused to discard the ripe fruits of over a century's experience of the carbonization of coal, and accept the immature produce of a few months' toying with it. Gas companies are credited with openly-avowed enmity to Coalite; and, consequently, the Directors of the British Coalite Company are said to be a little chary of throwing open their works to the criticism of the gas industry. We are not aware that gas undertakings have displayed or avowed any enmity to Coalite, though they have been forced in protection of their customers and proprietors to expose the hollowness of the claims made for Coalite and the process of its manufacture. This was necessary on their part, in order to prevent, as far as possible, the markets for their bye-products becoming disorganized by large quantities of similar products being disposed of by an inexperienced outside operator, whose powers for mischief would be measured by the amount of capital with which gullible investors might provide him. Fortunately, the British Coalite Company were not so successful as the promoters had contemplated in obtaining funds from the public wherewith to operate, and, fortunately also, a fair proportion of the funds actually collected must already have been dissipated in the year's experimenting, which is euphemistically spoken of as perfecting the Company's process! Gas undertakings naturally rejoice to know that the Company's powers for mischief have been curtailed thereby, and that if the investor continues to stand aloof, the funds remaining at their disposal will not serve for any very prolonged dumping of their products on already depressed markets. But, beyond taking natural steps for the protection of their interests, gas undertakings generally have displayed no *animus* towards the Coalite Company—rather they have been constrained to extend pity to the unfortunate shareholders in the concern, and have from time to time tendered sound technical advice by which the Company might profit, when contemptuous disregard of their methods might have served to bring their activities to an earlier close.

That the British Coalite Company found themselves immediately after formation in need of technical assistance is shown by the fact that some twelve months have been spent in experimenting with a view to "improving" or "perfecting" the process, which, at the time of the floating of the concern, was represented as absolutely ready for adoption in every gasworks and town in the kingdom. The Company have succeeded in modifying the process; but without more intimate knowledge of its past and present character than it has been possible to acquire from the scanty information divulged by the Company, we are unable to say whether the modifications are beneficial or otherwise. It seems that the temperature of the carbonizing vessels used has been reduced from the about 800° Fahr. specified in the master patent to about 750° Fahr., and the form of the carbonizing vessel or retort has been considerably altered. The latter seems now to consist of 6-inch vertical iron tubes, slightly tapered to facilitate discharge of the contents, cast in groups of twelve. The Company have found it necessary to erect a foundry of their own for the production of this elegant item of plant. One would suppose, from the tone of one of the latest effusions of the

Company, that iron gas-retorts had not been set vertically even a century ago, and that tapered vertical retorts were not now in use on gas-works; also that it was a complete innovation, giving the coalite makers a great advantage over gas undertakings, to transport the coal from ship to retort by mechanical means, and that gas managers had never drawn a charge in less than six hours from the time it was put into the retort! There is probably scarcely a gas manager in the country who has not at some time, under stress of fog or of a strike, been compelled to be content with four hours or less for working off charges in his retorts, in order to increase the output of gas per diem. Yet it has remained for the Coalite Company to harp on the advantages which will accrue from limiting the carbonizing period to three hours, as though it were unknown to gas men that a greater make of gas in unit time can be secured by shortening this period. Another confusing statement which is made is to the effect that from 16 to 25 per cent. of the coke manufactured on gas-works is consumed in heating the retorts, and that only 6 per cent. of the coalite obtained will be similarly used. This line of argument, if followed up, would lead to the conclusion that it is unprofitable to make coalite, because 6 per cent. of it is consumed in the process; whereas if crude coal continues to serve in place of coalite, this 6 per cent. of fuel is wholly saved!

Reference is made in the advertisement article in "The "Times"—unfortunately, we think, for the coalite cause—to the researches reported on another page of to-day's "JOURNAL" by Professor A. H. White and Messrs. F. E. Park and W. A. Dunkley on "The Destructive Distillation "of Coal at Low Temperatures." The testimony of these investigators is said to be of high value, and "the claims of "coalite are confirmed to that extent." We agree as to the high value of the testimony afforded; but it happens to be almost wholly unfavourable to coalite. The extent to which the claims of coalite are confirmed is merely that the resultant product of heating coal to 500° C. is lower in volatile matter and (in the case of coals initially high in oxygen) higher in heating value than the original coal. There is but little in this to justify the exaggerated claims made on behalf of coalite; and it was misleading—to use a mild term—to quote the statement in question apart from the context, which we have now supplied. Let us pass on, however, to other words of testimony from the same source, bearing in mind that it is the Coalite Company themselves who have invoked the aid of such testimony therefrom as suited their purpose. We may quote *verbatim* from the report of the investigations:

> **So far as can be foretold from these small-scale tests, a process such as this could be a commercial success only under rather unusual conditions. It can hardly be successful as a method of manufacturing illuminating gas because of the low yield. There may be products of unusual value in the liquid distillates; but it is not known that such is the case. The resultant coal may sometimes have a higher and sometimes a lower heating value than the usual gas coke; but in the case of gas coals, the yield of modified coal by this process is apparently not much greater than the usual yield of coke, and it would not seem that the process could be commercially successful as one for making prepared fuel.**

We hope that in the continuation in "The Times" of to-morrow of its serial advertisement story of "The Progress "of Coalite," the Company's publicity department will give us the reference for use next week to other "wholly inde-"pendent testimony of high value." Our own testimony might be put aside as neither independent nor of value if it were not backed by authorities of the British Coalite Company's own choosing.

Publicity.

COMPETITION there always has been; and competition there always will be. With time, however, the number of competitors increases; so does the strenuousness of the competition. Look around, and compare the rivalry that there is in these times with that experienced (say) thirty years ago. Then oil was the greatest competitor of town gas for artificial illumination. Now oil is being gradually pressed out as a lighting agent; but town gas has to meet in this line of business the more forcible competition of electricity, acetylene, and air-gas plants. Gas and other means of obtaining motive power are largely cutting their way into the, at one time, strongly protected possessions of steam; but town gas has, as its competitors, not only steam and electricity, but producer and suction gas, as well as oil. In cooking and heating, gas has not an economical or efficient rival in electricity or oil. As a matter of fact, the electric radiator and the various electric cooking appliances make a very dispirited show against gas in respect of heat efficiency; such electrical appliances, published calculation assures us, only giving to the user about an eighteenth part of the heat of the coal put under the boilers at the electricity generating-station, without taking into account costs and losses involved between the boiler and the radiator or other utilizing appliance. The modern development of the water-circulating system with gas heating is an advantage not enjoyed by our rivals. But though town gas has pre-eminence in lowness of cost, in reliability, and range of utility, these excellences cannot subdue competition—in fact, they are incitants to greater energy on the part of trading rivals. For if those rivals could, through economy, efficiency, and utility, ride rough-shod over gas, there would be no need for the extravagant methods of publicity that have become the vogue—more especially among electrical folks. Leaflets, circulars, bulletins, and posters, containing meretricious, malicious, and mendacious statement or pictorial misrepresentation, are now quite common modes of seduction and of gaining notice. Leaflets, circulars, bulletins, and posters would be legitimate methods of ministering to their designed end were they free from the reproach of falsity and indefensible slander. But they are not; and they have to be met.

The question is, How best to meet them? The circular nuisance is a growing one; and householders are more prone than ever now to show resentment, and to consign these uninvited printed missives, without perusal, to the fire or to the waste-paper basket. What is wanted is some means of bringing announcements to the notice of all classes of inhabitants, whatever the form of lighting, heating, or power agents they employ, without making a personal matter of it by sending circulars through the post, or stuffing them into the householder's letter-box, unless it be a well-worded argument sent round—not specially, but with the quarterly account. The impersonal form of advertisement in our view cannot take better form than in the local newspapers or on the local advertisement hoardings. Many years ago, we strongly advocated advertising in local newspapers; and we are glad to see from several quarters that the practice is now regularly followed by gas suppliers. There is a further publicity advantage, in that the local newspaper being so patronized is not, as a rule, slow to recognize that in business matters reciprocity is a tangible factor in perpetuating good relations. However, the newspaper is deliberately purchased, it is taken care of until read, it passes from hand to hand in the household, and does not so promptly meet with the ignominious fate of the circular. Trading announcements can be served up therein, to customers and patrons of opponents, without having upon some people the inflammatory action of the innocent circular. Advertisements need not week by week appear in the same paper; but the same advertisement should be inserted in rotation in the various papers whatever their political colour; so that people of all classes and political or newspaper preferences or bias may be reached. It matters not to a gas undertaking whether its customers are Conservatives, Liberals, Radicals, Socialists, or what not, so long as they pay for what they consume. But in making use of such advertising channels, we would point out what appears to be lost sight of by some gas undertakings, that advertising should be done systematically and regularly, and that there should be change of matter and fresh display, to realize the intended effect. The same advertisement appearing months on end tends to pall, and does not impress. There should be seasonal change. In the spring and summer, the cooking-stove and water heaters and circulating systems should receive the greatest prominence in the advertisement; and at the end of the summer and in the autumn and winter, lighting and the gas-fire should be the features specially destined to capture the eye, with announcements in less conspicuous characters about other branches of business, but occasionally giving these branches in turn the special place. The advertisements should be printed so that some special feature unfailingly causes the reader of the general news to pause.

The subject of advertising has been suggested at this time by the prominence that has recently been given to gas in the advertisement columns of popular weeklies and papers appealing specially to certain classes of the community, and particularly in certain London daily papers, and there in a not uninteresting form; the centre columns of the page being occupied by articles concerning the uses of gas and the side columns

by advertisements. The "Daily Chronicle" for last Tuesday may be specially instanced; the two largest portions of advertising space on a page being occupied by the Gaslight and Coke Company and the South Metropolitan Gas Company. These undertakings are large, and can afford to have their own advertisements if they so desire, and put into those advertisements just what they like. But it does seem that in London where all the daily papers have free circulation in every quarter, that more effective advertising could be done by a joint scheme. We do not say the matter would be more effective; but the money spent on two advertisements in one daily paper could be expended to better end by having one advertisement in two daily papers. The same with bill posting—a joint poster (not imitations of the highly coloured pieces of extravagance published by the Associated Municipal Electrical Engineers of London) could be scattered far and wide over hoardings in the Metropolis to the common advantage. There is for the greater number of hours in the day, an incessant passing from the limits of one gas supply to another. There is free intercommunication between the residential suburbs and shopping and pleasure-giving London, and between the myriads of employment-providing premises of London and its residential environment. There is plenty of argument to be found for joint schemes of public advertising by gas undertakings, and for getting the best value for money spent in this way. Throughout the country, there is much territory in which, in addition to local advertisement, there could be joint schemes of advertising—in the papers of county circulation, on hoardings, in trains, and on tramcars and omnibuses. But for such advertisements, the exaggerations of competitors must not be taken as exemplars. Incontrovertible facts only must enter into their composition. In this way will advertisers be kept outside the meshes of controversy, and be in a position to prove to customers in practice the truth of advertised statement. However adroitly false statement is let loose, it is sure to return some day to confound its authors. Before leaving the subject, it should be acknowledged that the question of joint advertising, though in more general form than is suggested here, was raised by Mr. F. W. Goodenough at the Dublin meeting of the Institution of Gas Engineers; and there has since been some incidental reference to the question by others.

Among the Juniors.

THERE is one thing the Junior Associations have brought well into the light, and that is a mass of talent in the second line of the gas profession that was in greater part previously concealed. There are many other good features about these organizations which all point to their existence being to the common benefit of the gas industry—present and future. But the revelation of formerly latent merit is to us, as it must be to others jealous of the interests of the industry, one of the several pleasing features that have developed from this movement in the sight of onlookers. This issue, perhaps more than any other, of the banding together, with purposeful and creditable intent, of the juniors has drawn towards their Associations much regard from the front rank of the profession, and from the leaders in that rank, who have, in tangible manner, gone out of their way to show their sympathy with the aspirations of their young followers. In turn, from the wells of their mature experience, Mr. Thomas Newbigging, Mr. James W. Helps, and Mr. H. E. Jones, among others, have delivered messages to the juniors—Mr. Jones being the latest. His message (as reported last week) came at a time when a life-story was before the juniors which, for them, offers an incomparable exemplar. It is the story of the life of a man who worked with the unselfish object of leaving the world better than he found it; and an abundant success in that altruistic purpose is the unanimous verdict of his contemporaries. In that life-story, there are the essentials that will serve to energize the ambitions of many a junior. Influence is not unceremoniously cut off by transition from life to death. As Mr. Jones admirably puts one salient characteristic, Sir George Livesey was a working man to his dying day; and he was one of those working men who scorned to neglect detail. If the same spirit animates the juniors in their individual lives, the gas industry will be the stronger. The Associations themselves, by the influences they bring upon the members, tend to quicken the mind, and to, as Mr. A. Morton Fyffe put it in his presidential address the other week to the Eastern Division of the Scottish Junior Gas Association, develop resource, observation, and enterprise. Contact, too, with fellow-men and competition with them sharpen the wits; and association in the discussion of the affairs of life's work produces almost unconsciously a recognition that the sterilization of intellect by inactivity is not what the fight in life demands of the individual.

But in their associated work, we would say to the juniors, "Do not attempt to do too much." Events seem to point to the goal of a central organization for the juniors, or to an annual combined meeting of some days' duration after the manner of the central senior organization. Neither the one nor the other is required. There is the indication in the address delivered by Mr. W. J. Liberty at the meeting of the Southern Junior Association. He points out that the Joint Councils of the Junior Associations have a permanent Secretary; that joint Council meetings have already been held in Manchester and London; and that Manchester is again the venue for another such meeting in February. There have also been joint visits of the Associations to the Manchester Gas Exhibition and to the Franco-British Exhibition. There is nothing to be said against any of these developments or doings, excepting that they all cost money, and would, if taken part in by them, be a heavy tax upon not a few of the juniors. We would strongly counsel the Associations not to go too far in this direction, unless there is some very special objective, such as the exhibitions in question. Against the occasional conference of the executives there is, otherwise, nothing to be advanced; it is no doubt helpful, but it is as far as it necessary to go. Mr. Liberty, however, is not alone among the more enthusiastic members of junior organizations in thinking that they can be made more useful still by the Associations of the country coming together for interchange of thought and opinion. We do not believe that they can do more useful work than they are accomplishing at present by any extension of what is already done through the Associations individually, and possibly through the conference of Council delegates. Let it be remembered that membership of the Junior Associations is transient; and though we hope these organizations will, like Tennyson's brook, "go on for ever," the end of that membership is transference to district and central senior organizations. But just as links have been forged between the senior District Associations and the Institution of Gas Engineers, so is it thought—as is, in fact, the case with the Manchester, the Yorkshire, and the Midland Junior Associations and the senior District Associations—there might be, throughout the country, a connecting bond between the junior and senior bodies. There need by this be no forfeiting of independence; and, as a matter of fact, the sense of independence and strength is deeper when one is not isolated from the mainland.

Glancing round the technical work that has been done in the present session, it possesses a large degree of both merit and interest; and part of it comes from specialized experience in the larger works such as is rarely brought before the senior District Associations. Instancing this may be named the address of Mr. James Hewett, before the Midland Association. He treated of railway waggons; and a perusal of his address must disperse any doubt, if any still lingers, that in larger capacity trucks than are the general rule at present, with hopper bottoms, there is to be found, including interest, depreciation, and maintenance, an economy per ton that will total to a considerable sum on even a medium-sized works. The figures given in the address (which was published on the 13th ult.) have afforded us much interest. There is not the slightest doubt that the larger capacity trucks are to be the vogue, though there will be limitations, imposed by the conditions referred to by Mr. W. Doig Gibb in his Institution address in June, and (in other respects) by Mr. James Hewett in his address. Some acceleration may be given to the construction of such trucks by the ordinance that, at the close of December five years hence, no waggons will be allowed to run on the railways of Great Britain that are not fitted with spring buffers. There are not a few of the old-fashioned dead-buffer type waggons still to be seen on gas-works sidings; and in view of the savings of the larger capacity trucks, the new requirement will greatly put out of existence waggons that, primarily made to convey, have the secondary effect of making much labour.

Incidental mention has been made of Mr. Fyffe's address to the Eastern Division of the Scottish Junior Association; and a later deliverance is that of Mr. A. H. Whitelaw, the President of the Western District of the Scottish Juniors. Mr. Whitelaw has the courage of his convictions, whether formed on sufficient ground or otherwise. This being so,

he advertised the thermal efficiencies and costs for motive purposes of producer gas and suction gas for all they were worth—and something more. Bare figures as to the costs of producer and suction gas have captivated many a manufacturer, as they have captivated Mr. Whitelaw. But the addition of lost time in starting up suction gas plants, cleaning valves, and attention to breakdowns, has largely spoilt manufacturers' beautiful day-dreams of power at next to nothing. Mr. Whitelaw will do much better, instead of contributing to the partial tale of the economies of competitors, by sticking to his special sphere of operations, and by assisting in forwarding the work of the gas industry in making, for all purposes in which heat is required, a distributed gas of good calorific quality the indispensable need in every quarter. There is no necessity for the gas industry to get down to the poor stuff, with all its drawbacks, known generically as producer gas. Distributed producer gas in this country and elsewhere has not been notable for any dividend-producing propensity; and as to private plants manufacturers are finding that all is not really cheap that is so ticketed.

One of the other notable contributions to the proceedings of the Junior Associations this session has been the lecture that Mr. Walter Hole delivered to the Yorkshire organization, in which he instructively treated of two dangers to the distribution system. The two dangers—the disturbance of mains by vibration and the sinister effects of electrolytic action—are generally known now in the larger towns; and thankful indeed would many engineers be, if someone would tell them how to escape the disadvantageous sides in these particular respects of modern public conveniences. In connection with vibration, Mr. Hole finds where pipes cannot be taken under a footpath, an envelope of concrete would be a great protection. All remedy or protection, of course, must run into money; and so would this one, together with an enhancing of labour expenses when making connections. As to electrolysis, Mr. Hole is not a convert to the dogma of the electricians that, within the limits of the Board of Trade regulations, no harm can be done to a gas canalization by an electric traction system. The experience of Mr. Hole refutes oft-repeated postulation. Although he has no ready system to offer for promptly preventing trouble, it is interesting to learn that, largely through Mr. Hole's instrumentality, return feeders have been introduced into the Leeds electricity transmission system, which have had a powerful effect in reducing the risks of electrolytic damage to the gas-mains.

These various illustrative references show that there is good quality in the technical matter presented to the juniors; and though all that Mr. Whitelaw says in his address does not (as seen above) commend itself, there is much else in it that is excellent in character and interest.

Municipal Works and Unemployment.

Municipal gas undertakings are largely concerned in local finance and expenditure, as representing in themselves a no mean amount of capital and as being considerable ratepayers; gas companies are concerned in municipal spendings likewise from their position of bearers of a large share of the local financial burden. Therefore, the administrators of such undertakings will be not a little interested in the scheme moulded by Mr. John Burns, the President of the Local Government Board, for the purpose of relieving the deplorable rigour of the evil of unemployment. The Government have taken measures to give additional temporary relief this winter, prior to entering into the matter with more direct aim to secure some sort of permanency of system in dealing with the trouble. Prospective Government measures have not, however, stood in the way of Mr. Burns taking, in his own practical style, immediate steps to help to alleviate the suffering and hardship of a low labour market at the time of the year when the severity of atmospherical conditions intensifies the misery of want. From all parts of the House of Commons (other than from some of his whilom friends of the Labour party), Mr. Burns has received, as he has merited, applause for the useful work he has performed in his ministerial capacity; and one of the most notable of his acts as a statesman has been what he has succeeded in accomplishing in connection with this unemployed question.

It is the view of the right honourable gentleman that relief works are no good in dealing with unemployment; they produce waste and useless work, and so are uneconomic. His belief is that, by "co-ordinating and disciplining" works of public utility with the vagaries of labour demand in the industries, work could be so levelled that the present gaping empty spaces in the employment line could be largely closed in. In other words, necessary public works could be postponed or antedated by municipalities for the purpose of meeting, to a considerable extent, the lack of employment during periods of industrial depression. About public works of the kind, there is from their very nature greater mobility, in respect of time of execution, than in any other sphere of work giving employment to the artizan and to the unskilled labourer; and this has been attested by the large compliance there has been with Mr. Burns's views on this matter by public authorities all through the country, in executing large works during this winter. The Metropolitan Water Board are among those, as the "Journal" last week testified, who have listened to the appeal of Mr. Burns, and have given their answer by putting in hand at once a large reservoir at Molesey. The importance of this scheme for helping to balance employment is evident when it is considered that during the last four years the aggregate amount of the loans approved for objects other than Poor Law purposes has been £39,186,153. Since Aug. 1 last, the Local Government Board have approved of 276 loans representing £1,308,967, which is all available for the winter's work; and 101 loans, totalling to £867,129, have been contracted by local authorities in respect of works of public utility which have been put in hand with the specific object of providing immediate employment.

The whole point of the matter for the ratepayers' (*quâ* ratepayers) consideration is whether this is an economic method of dealing with the ugly problem, though anything that is done in this way cannot be expected to wipe out the trouble completely. On the whole, however, we should say that it is the best method, though some of the burden of so dealing with the difficulty is, in a measure, merely shifted from the agency of the Poor Law Authorities to that of the municipal authorities. Works of public utility are necessary. There is no waste therefore in carrying them out. But any set of circumstances that forces their execution at a particular time may cause money to be borrowed at a dear rate; it may be that bringing reproductive work forward may cause a large proportion of capital to be lying idle longer than would otherwise be necessary, and thus entail an amount of additional interest; it may also be that just at the time the work is put in hand, materials may be comparatively dear. But these are uneconomic contingencies that must be borne for the sake of a practical expedient in a humane cause. At the same time, ratepayers cannot overlook the fact that there is a price to be paid in carrying out this beneficial scheme for labour. They have also to realize that the shifting of work from one period to another will not guarantee that the gain at one time will not produce greater severity at another. But if all such problematical points as these be taken into account, nothing will be done. Gas undertakings cannot seriously help in advancing Mr. Burns's scheme. They can do a little, such as the Birmingham Gas Department are now doing in building a new retort-house this winter. The very nature of the business of gas undertakings, however, demands that, for the most part, works alterations and extensions should be carried out during the summer months. But in the industry it is a satisfaction to know that throughout the winter employment reaches its maximum.

The Output of Coal.

The position of the United Kingdom as a coal producing country, and the enormous importance of this national asset, are again demonstrated by the Home Office statistics for 1907, which were issued a few days since as a Blue-Book, and are noticed at some length in another part of this issue. Last year was a highly satisfactory one for the coal trade, both in the matter of output and of prices realized. Though we are now so near the end of 1908 that much of what happened in 1907 has been relegated to the domain of history, the figures contained in this report —and perhaps more particularly those with regard to output— are still of outstanding interest. Certainly the statistics show that the demand for coal last year was brisk; but the increase in the average price per ton realized was even more pronounced. The quantity of coal raised in the United Kingdom was about 268 million tons, as compared with 251 million tons in 1906; and both these figures constituted a record at the time of their accomplishment. Thus there was a gain last year of nearly

17 million tons, and of this increase more than 8 million tons were exported—in fact, the total quantity of coal which left the country, either in its own form or as coke and patent fuel, and including that shipped for the use of British and foreign steamers engaged in foreign trade, was over 85 million tons. This left some 183 million tons for home consumption, which works out at 4·142 tons per head of the population. On no other occasion during the past thirty-five years (over which period the statistics extend) has the consumption per head been so high; the nearest to it having been in 1900, when it was 4·052 tons. Such a figure as was reached last year proves that trade must have been much more than usually good in this country, as well as in France, Germany, and Italy, who took coal to the value of £6,297,659, £5,433,497, and £5,505,485 respectively. The total declared value of the coal exported abroad last year was £40,170,296, as against £30,069,307 in 1906. Thus there was a big increase in the money received by us, as well as in the quantity of coal that left our shores. In connection with the latter consideration, it may be pointed out that the amount of coal shipped abroad shows an unbroken increase in each quinquennial since 1873. In the five years from 1873 to 1877, the amount shipped was 13·8 per cent.; while in the period from 1903 to 1907 it had risen to 29·5 per cent. During the past 35 years, no less than 6,331,104,000 tons of coal have been raised; and of this 1,404,654,000 tons, or 22 per cent. of the total production, have been shipped abroad as exports in the form of coal, coke, and patent fuel, and as coal used for steamers engaged in foreign trade. The value of the coal raised in the period named is given as £2,245,103,000. These are indeed stupendous figures. On the matter of price, it may be mentioned that the average amount realized at the pit in 1907 was 9s. per ton, compared with 7s. 3½d. in the previous year. The average price in the London market was 19s. 9d. per ton last year, and 15s. 9d. in 1906.

Electricity and Fires.

It is an old observation that, when electricity is up to mischief, it does its work thoroughly. This has been seen by the recent occurrences at the Paris Telephone Office and at the Brussels Central Telegraph Office. Such mishaps, merely involving tens of thousands of pounds, are getting quite common, and do not now arouse much curiosity. The interest in the two Continental events was beginning to slumber when a cablegram last Wednesday told us that the Government Buildings at Bloemfontein were ablaze, and a later one that the building was practically gutted. The fusing of an electric wire in an attic was the cause; and, according to the correspondent, electricians were, when the fire broke out, "actually searching for the leak in the current which caused it." We shall no doubt be told that it is more likely the fire was due to a junior clerk indulging in a cigarette or to a match being carelessly thrown down, or to a wooden beam in a chimney, or to—well, let us stop there. The apologists for electricity are good enough at invention of excuse without outside aid. Estimates of the loss at Bloemfontein, due to this fusion of an electric wire, run up to the respectable figure of £100,000.

Free Labour in Congress.

Trades Unionism has, of recent times more particularly, so asserted itself that, without a periodical reminder, many people might be in danger of forgetting—or at any rate overlooking—the fact that there is still a large body of labour not connected with any of these organizations, and therefore free from the laws and limitations of which membership of a Union necessitates the strict observance. For this reason, if for no other, it is desirable that some publicity should annually be given to the Congress of the National Free Labour Association, which is held in London towards the end of each year. The 1908 gathering was held last week; and some record of the proceedings did find its way into the newspaper Press, but on a much different scale from what we are accustomed to see in connection with the Trades Union Congress. Yet the free labour delegates represent a large number of workpeople, and their resolutions are at least as practical as those of their perhaps more numerous colleagues the Trades Unionists. At June last 680,000 persons were on the registers of the Free Labour Association—45,000 names having been placed there during last year, while in the same period 182 employers made applications for workmen. Thus, considered even solely in the light of an agency to bring together employers and would-be employed, the operations of the Association are by no means negligible. But, of course, the peculiar circumstances under which its good offices are so frequently requisitioned—in cases of stoppage of work by Trades Unionists—constitute a reason for regarding the organization as a really serious factor in connection with the labour problem. To revert to the congress, it may be remarked that Mr. Joseph Penrose was appointed Chairman; and he delivered an address in which he urged that the great responsibility for the compulsory membership of Trade Unions must rest with the employers who had entered into agreements with those bodies, thereby compelling the workmen to join the Union or else to leave their employment. This may be all right theoretically; but practically the large colliery owners at least might justly urge that the pressure put upon them by the Unions had left them no alternative but to submit to their dictation. No doubt many employers would be only too pleased to free themselves from this tyranny, if they could see how it could be done. The congress expressed the opinion that "the true solution of the unemployed problem would only be found by taxing foreign manufactured goods, by closer relations between this country and the Colonies, and by the perfect freedom of action between employer and employed, as well as by the enjoyment of perfect equality of industrial rights and privileges by Unionists and non-Unionists alike." If this be so—and in the absence of any better scheme, one might not be disposed to quarrel with the suggestion—it is to be feared that we are still far from a satisfactory settlement of this vexed question. One more point may be briefly noted—that the congress are in favour of Boards of Conciliation on which free labour is fully represented. But they have no confidence in the Board of Trade's proposed permanent Arbitration Courts, "seeing that the Labour Department of the Board, as at present constituted, is entirely composed of Trade Union officials, whose reports are biassed, one-sided, and absolutely unreliable as regards the general employment of labour," and, further, the Board's interference in labour disputes has invariably been in the direction of forcing the recognition of Trade Union views and aims upon employers.

PERSONAL.

Mr. M. S. BLAKER has been appointed Chairman of the Lewes Gas Company, in succession to the late Mr. C. R. Kemp; and Mr. EDWARD MONK., jun., has been elected to fill the vacancy on the directorate.

We learn that Mr. WILLIAM WOODWARD, who for many years has occupied the position of Engineer and Manager of the Bromley Gas Consumers' Company, has been appointed by the Directors to be Chief Engineer of the larger Company which has resulted from the amalgamation, in accordance with the Act passed this session, of the Bromley and Crays Gas Companies. We wish Mr. Woodward every success in the enlarged responsibilities that have come under his care.

There was a large gathering at the Gas Offices of the Coventry Corporation on Monday last week, on the occasion of the celebration of the golden wedding of Mr. J. HAMMOND, a member of the staff of the Gas Department. Mr. Fletcher W. Stevenson, Engineer and General Manager, presided, and, on behalf of the staff, presented Mr. Hammond with a silver cruet-stand, as a mark of the esteem in which he is held by his fellow-employees. Mr. Hammond, in expressing his thanks for the gift, gave some interesting reminiscences in connection with the Gas Department, and contrasted the conditions of work now and when he first went to Coventry fifty years ago. He referred to the kind and courteous manner in which Mr. Stevenson treated all the members of the staff, and said they were fortunate in having in him one of the best men in the profession. The proceedings closed with an expression by Mr. Matthews, on behalf of the older members of the staff, of the hope that Mr. and Mrs. Hammond would be spared to enjoy many more years of wedded life.

Companies and the Franchise.—The President of the Local Government Board received a private deputation from the Institute of Directors, in his room at the House of Commons, last Wednesday afternoon, with reference to the Municipal Franchise (Mercantile Corporations and Companies) Bill of the present session. Sir William Holland, Bart., M.P., who introduced the deputation, pointed out that the Bill, which has already passed the House of Lords, was drafted by the Institute, and asked that the Government should grant facilities for it to be discussed, with a view to its passing during this session. He stated that it was estimated that in the largest cities companies pay one-third of the rates, and yet have no vote. Other members of the deputation having spoken, Mr. Burns, in the course of an interesting and instructive reply, said he could not hold out any hope of the Government granting the facilities asked for.

GAS STOCK AND SHARE MARKET.

(For Stock and Share List, see p. 366.)

BUSINESS on the Stock Exchange last week was, on the whole, decidedly quiet, and the tendency was fickle and changeable, in obedience to varying influences swaying it from time to time. But at least there was nothing to create active alarm; and a sort of tiredness of waiting for better things was the worst. The opening was languid and out of heart, looking for support and finding none; and prices in the chief markets shrank. Tuesday was rather more active, and brighter at the prospect of the fortnightly settlement being light and easy. Prices mostly were better, except among the choicest gilt-edged securities. More favourable views on Wednesday in regard to a solution of the Eastern difficulty cheered all departments, and Consols advanced $\frac{1}{8}$. On Thursday, this situation was maintained; and the satisfactory conclusion of the settlement had a good effect. On Friday, though foreign politics looked no worse and home trade disputes seemed rather better, the usual realizing was in action and rather heightened by the fact of Monday being a close day. Consols and some of the best gave way; but the shrinkage was not general. Saturday was a very quiet day, with slight and irregular movements. In the Money Market, the Stock Exchange requirements and the demands of the month-end brought a strong call, and money could be profitably employed. But discount rates were barely steady, and were weakening at the close. Business in the Gas Market was no more abundant than the week before; but there was no sign of any lowering tendency as then. The tendency, indeed, was all the other way. Several quotations of undertakings in each geographical group improved on their latest figures. In Gaslight and Coke issues, the ordinary was moderately active at from 97 to 98¼ (a rise of ½). The secured were very quiet; the maximum marking from 88 to 88¾, the preference 106 and 106½, and the debenture 85¼. South Metropolitan remained rather inactive, with a few dealings at from 120 to 120¾. The debenture rose a point, changing hands at 85 and 85¾. Commercials were not much dealt in. The 4 per cent. was done at from 106½ to 108; and the 3½ per cent. at 103. In the Suburban and Provincial group, all Bournemouth issues advanced, and the "B" was done at 16$\frac{9}{16}$ and 16¾. Brentford old marked 247, ditto new 185 and 186 (the quotation rising 2), Bromley "B" 85, and Lea Bridge 119. In the Continental companies, Imperial continued in good demand at from 184½ to 186 (a rise of ½), European fully-paid was done at 23½ and 23¾, ditto part-paid at 17$\frac{1}{16}$, and Cagliari at 25½. Among the undertakings of the remoter world, Buenos Ayres changed hands at 11$\frac{3}{16}$ and 11$\frac{5}{16}$, Melbourne 5 per cent. at 101½ and 101⅝, Oriental at 141, Primitiva at 6 *cum div.*, ditto debenture at 95, and River Plate at 13¼ and 13$\frac{5}{16}$.

ELECTRICITY SUPPLY MEMORANDA.

Puff Advertisements and Stale Sayings—Present Position of Arc Lighting—Defects of Flame Arcs—Indifference of the Wire-man—Equity in Public Lighting.

THE Manchester and Salford Corporations cannot complain that the local newspapers have been in any way niggard in giving free advertisement to the Electrical Exhibition at Platts Fields; but from hints thrown out here and there, while the week-end attendances—as week-end attendances at such places usually are—have been large, the quantity of business within sight as a result bears no corresponding relation. But the exhibitors may be comforted, as they had to be after the Olympian show, with the thought that bread thrown on the waters may return to them after many days. There need be no grudging of the exhibition the multi-columned puffs that it has received in the local press; without this aid the exhibition would not have been self-attractive. The puffs have formed interesting reading. Many of the statements made have been inspired or have for their authority no less an immaculate source of information than the catalogue; and in certain cases imagination has had free play. There have been some articles in the "Manchester Courier" from the pen of Mr. R. J. Nicholson; and he is one of the writers who have allowed their fancies to run loose. According to him, ten years ago, the gas industry was languishing under the inadequacy of the flat-flame burner. Then Dr. Welsbach evolved an incandescent mantle; and the gas industry took a fresh lease of life. Mr. Nicholson exposes an ignorance which will reveal itself to him if he takes the trouble to look up the history of the incandescent mantle. Two other statements come into violent collision in the same article. "The astonishing attainments in matters of economy," we read, "with which the incandescent mantle was credited by those interested in the gas industry, were somewhat difficult of substantiation; and the comparative costs of lighting by gas and electricity trumpeted forth by the gas faction were obviously calculated to convince only those whom Providence had sparingly endowed with the faculty of reasoning." But a little later on in the same article we read: "Experience proved that gas bills were very materially reduced; and more perfect methods of production achieved a cheaper and much stronger mantle. In shop windows, in the streets, in the home, the great unthinking public saw a light more brilliant than ever before. The meters indicated reduced gas bills." After this, let us meditate awhile on the writer and his words: "Those whom Providence had sparingly endowed with the faculty of reasoning," and at the same time remember the exhortation that those whom Providence hath joined let no man put asunder. Of course, Mr. Nicholson publishes the trite words of the modern electrical advocate, that the efficiency of the metallic filament lamp is so high, and consequently the cost of lighting is so low, that at last it can be asserted (and proved) that electricity is to-day the cheapest of all illuminants. Mr. Nicholson should offer to make a name by taking up the Welsbach challenge.

Mr. E. E. Hoadley, of Maidstone, is one of the few electrical engineers who can, when in the mood, write about gas and electric lighting without going to extremes. There has been distinct interest in reading an article of his in the "Electrical Review," on the "Present Position of Arc Lamps and Arc Lighting." If there is one complaint to be made of the article, it is that, of its three-column length, one-half has to be perused before we get anywhere near the "present position." In the early part of the article, one is impressed with the persistence in duration of some experiences. Speaking of the early days of arc lights, and their use, Mr. Hoadley says that "those responsible for the financial side of the matter, paid the large sums charged for arc lighting without grumbling, thinking that they were getting value for money." Electricity was ever a gay deceiver; and there are local authorities who manage electricity undertakings who still "think" that by electric arcs they get value for money. But let that pass, and give our readers some notion as to what Mr. Hoadley considers to be the present position of arc lighting. The ordinary arc lamp, it seems, is gradually taking its place among the things that have had their day, and now the flame arc lamp and the small current single enclosed lamps are the favourites. Upon Mr. Hoadley's testimony, the latter lamps are respectable enough for the gas manager to keep his eye upon in the competition for shop lighting. These lamps take about 2·2 amperes and consume ¼ unit per hour, and will compete with "clusters" of incandescent mantles. Their efficiency must therefore be marvellous. Their small size makes them, we are told, exceedingly useful for the lighting of shops and shop windows. In the smaller towns, these lamps, it is mentioned, have been very successful, as 1d. per hour for a good light appeals to the average shopkeeper. Mr. Hoadley knows of one town with a population of 35,000 in which 200 of these lamps are in use! How very pleased those 35,000 inhabitants must be!

Regarding the flame arcs, Mr. Hoadley first dissembles his love, and then promptly proceeds to kick this class of lamps downstairs. Flame arcs, he avows, are made "which fulfil the required conditions very well indeed; and judging by the number that are seen, there is a large field for their sale and use. For street lighting, the fact of their generally short hours of burning is against them, but the exceedingly ingenious magazine of carbons, and its mechanism enables this to be got over." That is the praise; now for the condemnation, which must be quoted to give it the full weight of Mr. Hoadley's authority: "The flame arc lamp is not at present by any means perfect. The points that can be urged against it are: First, high carbon cost; in some cases the cost of carbons approximates to the cost of the electrical energy. Where cheap carbons can be used, as in magazine lamps, other drawbacks are introduced—viz., every time a new pair of carbons comes into operation the light is extinguished for a short time, varying from ten to thirty seconds; and the complicated mechanism of the carbon feeding and changing gear is out of place inside the case of an arc lamp. Although great advances have been made in flame lamps, plenty still remains to be done, particularly in the direction of the use of cheap short carbons, with a very much simplified mechanism." This being the "present position" of the flame arc after dwelling long in the land, its struggles for greater perfection will be watched with mixed feelings of interest and sympathy.

Another article published by the same contemporary is from the pen of Mr. C. C. Metcalfe; and it touches a very raw point in connection with electric wiring and fitting. Our readers know the battle there has been between casing, conduit, lead-covered and other systems of wiring, and of the good points and ailments of each. Mr. Metcalfe agrees that they all have their inherent good and bad points; but he blames the inefficiency of the wiremen to-day more than the wiring systems for much of the difficulty that has been hampering the electric supply industry. There will be trouble when the electrical contractors have an opportunity for having a turn at Mr. Metcalfe; for they will not sit quietly under the imputation that the experience of twenty years finds them with men little better than those they had at the beginning of the period. But if only half the charge is true that Mr. Metcalfe makes, it is a serious matter; and causes one to reflect on the futility of the wiring legislation of the Institution of Electrical Engineers and the Fire Offices when it is possible for work to be done in the manner he so vividly describes. Hear this: "It is unfortunately at present only too common to see workmen hammering screws into capping, pulling by main force conductors into conduit, scraping insulation (including half the copper strands) off flexible, and leaving bunches of cotton trailing into fittings, not to mention hosts of other examples of careless workmanship." And this again: "Whether it is due to the rush that becomes necessary on low-priced installations or to sheer indifference on the part of the men themselves, it is difficult to say; but carelessness in detail (and all good work depends on detail) characterizes the great bulk of the wiremen's methods to-day."

Also this: "It is very discouraging to see the shiftless methods adopted by the majority in jointing and connecting-up fittings, &c., and also the lack of general electrical knowledge exhibited by them." The scope for bad work, according to this declaration, appears to be a large one in connection with electrical installations; and as bad work is "only too common," it might be suggested to the electrical engineering profession that a little more supervision and compulsion to do the right thing might produce a change, and give some relief from recurring difficulty. What is the good of a specification of a hundred clauses or more, if there is no one to see that the conditions are properly observed?

The reading of an article on public lighting by incandescent electric lamps that has also appeared in the "Electrical Review" indirectly raises once more the question of the inequitable way in which some local authorities are dealing with the public lighting. The greatest sinners in this respect are municipal bodies with electric lighting undertakings in competition with private gas undertakings. In the first place, the main thoroughfares are lighted by them with costly arc lamps—these main streets being within the area of original electricity supply, mapped out as the one promising the most lucrative private business. From these main streets gas for street lighting is evicted, solely for the purpose not of securing a greater efficiency in this particular public service, but of giving the electricity station a profitable customer. The metallic filament lamps are inducing these same authorities to cast their eyes further afield. This brings us to the point of equity in dealing with this question. The writer of the article says: "When the question arises of lighting a whole district with lamps of smaller candle power and a correspondingly low return, there are many details to be entered into, in order to obtain a good financial result. Many of the lamps will be in a position which calls for outlay on mains with no other return than the yearly payment derived from the use of the lamps." That is the point. The electricity supplier prefers to pick and choose, where he has the ear of the lighting authority, and leave the gas company the public lighting in the most unproductive portions of the district. Just consider this. The gas company have long since laid down their distribution system, and have developed it in a manner to supply all thoroughfares and by-ways in a town, and, in numerous cases, in order to keep on good terms with the local authorities, have laid considerable lengths of piping from which there is precious little revenue drawn other than from the widely-spaced public lamps. It is just such unprofitable public lighting as this that the local authorities owning electricity undertakings despise, and would like to see retained by gas suppliers, while themselves taking over the whole of the streets where there is a prospect of extracting something from private consumers. This is a pretty picture. The gas companies have already spent their capital in laying pipes and connections; and they have taken the fat with the lean. But the municipal electricity department covets the fat, and rather than incur an unprofitable capital expenditure, would, with a magnanimity that courts our admiration, leave the gas company in undisturbed possession and enjoyment of the lean. There will be more gas companies shortly following the example of that at Tunbridge Wells, and saying: "Very well, it costs us more to carry our gas to the outskirts of the district, we do less business there, and our expenses generally are greater per lamp, and so we must charge you more per lamp for the service, if you are going to deprive us of the more profitable part."

Benevolent Fund of the Institution of Gas Engineers.

There will be a special meeting of the contributors to the Benevolent Fund of the Institution of Gas Engineers at the Hotel Cecil next Thursday, at 6 p.m. (in accordance with Rule 31), for the appointment of a Trustee to fill the vacancy caused by the death of Sir George T. Livesey.

The French Bibliographical Review of Gas Articles.

The fourth leaflet compiled by the Société Technique du Gaz, relating to articles of interest to the gas industry published between April and July last, calls attention to six descriptions of coal-handling plant. A coke-oven discharging machine was described in "Iron Age" of April 23, and in "Le Génie Civil" of June 27. In the latter was also given an account of the coal-weighing elevator erected for the port of Leith. Similar apparatus at Newport (Mon.) is mentioned. Large steel coal-storage hoppers have been erected at Tourcoing at a cost of 246,360 frs. (nearly £10,000). Trucks run above them, and are emptied directly into the hoppers, which are arranged in pairs with facilities for mixing the outgoing coal. Electric coal transporters have been installed at Genoa, which is the chief port of Italy for receiving coal. Lastly, a coal motor-waggon, heated by coke, as used in Paris for the delivery of coal, is described. The life of cast-iron pipes is considered by M. Lidy in "La Technique Sanitaire" for April, 1908. Several articles are named referring to electric lighting and heating; and descriptions of gas-producing plant and engines are numerous. Other headings comprise bye-products, photometry, and the chemistry of gas. Certainly, the leaflet of the Société Technique enables the French gas engineer to keep in touch with branches of engineering other than his own; and it facilitates reference to periodical contributions that might otherwise easily be overlooked.

THE PROPOSED GAS-TAX IN GERMANY.

THE projected tax upon gas for the purpose of increasing the national revenue in Germany is being vigorously opposed by those interested in the supply and consumption of gas in the Empire. The grounds of the opposition are interesting and instructive, and as such a tax is sometimes lightly suggested even in this country by unthinking persons of a political bent of mind, it will be useful to put on record in the "JOURNAL" the more cogent reasons now being advanced in Germany against the projected taxation. They have been set out in two communications in the last numbers to hand of the "Journal für Gasbeleuchtung." The author of the longer, and perhaps the more authoritative, of these communications uses the pseudonym of "Monitor." Both of the papers have been reprinted in pamphlet form for general circulation.

"Monitor" at the outset admits the necessity of raising more revenue for Imperial purposes, and believes that the public recognize it also, and only desire that the increased taxation shall be imposed in directions and in ways in which it will be least burdensome and irksome to the community. He concedes that in the search for new sources of revenue, gas rightly should come under consideration; and he then proceeds to discuss whether a gas-tax would fall properly in any category of generally recognized legitimate forms of taxation. Income-tax in Germany is raised mainly by the individual States, and is therefore not extensively available for Imperial purposes. A progressive tax on income he thinks is most rational. A tax on gas, however, certainly cannot be held to come in the category of taxes on income. Next to income-tax come the imposts on luxuries or such articles of diet or use as are not directly essential for subsistence. Among these are named champagne, sugar, tobacco, beer, and brandy. The tax on travel tickets (lately imposed in Germany) also may, with some justice, be included in this category, as many persons have in consequence of it been satisfied to travel by a lower class. It is pointed out that the whole national revenue of Great Britain is derived from the direct taxation of incomes and by heavy imposts placed on a few luxuries, &c.

A tax on gas, however, could not be placed in the latter category. Gas, whether regarded as a lighting or a heating agent, cannot at the present day be regarded as a luxury. Electricity is used wherever lighting is required for mere display; and the greater number of theatres, concert rooms, large hotels, banqueting halls, fashionable dwelling houses, &c., also now use it. Gas lighting is much cheaper than electric lighting; it is therefore only natural that the middle classes have always adhered to it, while the lower classes are taking to it more and more freely. In Germany, for instance, 0·1d. per hour suffices to maintain a 100-candle power gas-burner; and poor people can afford this. Gas lighting is therefore no luxury; and while a petroleum lamp may perhaps be somewhat cheaper, the small extra expenditure on gas is justified on account of its greater cleanliness and convenience, and the advantage to the eyesight afforded by really good illumination. Moreover, gas has become indispensable for heating. It is used for cooking by all classes, even by the factory hand and the hard-pressed wife of the working man. In the kitchen, gas presents the advantages of cleanliness and economy. It does not overheat the room and needs no attention. Its use in households also for the supply of hot water to baths and for heating bedrooms, &c., has recently developed to an enormous extent. The consumption also for heating purposes in factories and workshops is likewise very considerable. [A long statement of the various industrial and commercial uses of gas follows.] It is evident therefrom that gas enjoys an extraordinarily wide range of applications.

After referring to the competition of electricity and gas in the city of Berlin, it is pointed out that an official statement has been issued to the effect that not one of the houses built of late years in the suburb of Wilmersdorf is without gas. This statement applies generally to all the new houses in the suburbs of Berlin. Even the quarters at the back of the older buildings, which up till a few years ago had no gas supply, have now very quickly been provided with it by means of service-pipes and prepayment meters and fittings installed at the expense of the gas undertakings. For these purposes, £350,000 has recently been expended in Greater Berlin, and over 90,000 prepayment meters have been put in. The time, therefore, is not far distant when every single family in Berlin will be able to use gas. Taking one section of Berlin—partly urban and partly suburban, including 870,000 inhabitants of various classes—it has been ascertained that there is a gas consumer for every 6·6 inhabitants. This indicates that almost every family already is using gas. In this section of the place there were on the 1st of July, 1908, 172,316 gas-meters employed, of which number nearly 13 per cent. were prepayment meters, 30 per cent. were 5-light meters, and 28 per cent. were 10-light meters. It is clear from these figures that the bulk of the gas consumption is by small consumers. Taking into account only suburbs where there are few factories and business premises, an analysis of the conditions of gas supply shows that there is one gas-meter for every four persons. In the poorer suburbs there is a preponderance of prepayment meters, which, however, in the well-to-do suburbs form but a small proportion of the total number. Nevertheless in both classes of suburbs the same ratio of one gas-meter to four persons is found to prevail. That gas is pre-eminently the light of the poorer classes is proved by the fact

that an analysis of the accounts for a district of Berlin having a population of 119,000, shows that 73·6 per cent. of the consumers pay on the average less than 8s. per month for gas, while 43·4 per cent. pay less than 4s. per month. These figures amply demonstrate that at the present day gas is no longer a luxury, but as indispensable a necessity for every town dweller as water supply and drainage.

Passing from the small consumer, "Monitor" proceeds to discuss the position of the large gas consumer. In one district he finds that there are 126 large consumers—viz., those whose gas accounts amount to between £15 and £1000 a month. Of the gas consumed by these large customers, 36·3 per cent. is supplied to railways, post offices, and public buildings, and 31·8 per cent. to factories. Nearly 27 per cent. is supplied to eating-houses and inns; so that only 5 per cent. remains for consumption in shops and other premises. There is no question of the use of gas as a luxury in these cases, for even in restuarants its chief use is in the kitchen. Lighting for the sake of display and show is almost always done by means of electricity.

"Monitor" next refers to the third class of taxes or imposts—namely, duties imposed for protective purposes. The object of these is to protect native industry against superior foreign competition. The most important of these duties in Germany is that on corn. The law makers, however, would naturally never have committed themselves to increasing the cost of the staple food of the people by duties, if it had not appeared imperatively necessary to protect the most extensive industry of the country—viz., agriculture—from destruction by the securing of better prices for its output. Similarly, German industry is protected by duties on manufactured goods; and the native oil industry is protected by a duty on foreign petroleum. A tax on gas, obviously, however, is in no sense a protective duty. The gas industry is in every respect a native one. Gas-works are built everywhere of native materials, and contribute largely to the business of the engineering and fire-clay industries of the country. The fresh gas-mains which are laid every year keep the foundries busy; and the supply of fittings for houses is a most important branch of industry. For instance, the city of Berlin has in the last ten years expended about £5,000,000 on new buildings on gas-works and extensions of the distributing systems, and half as much more has been spent in the suburbs. The principal raw material of gas manufacture—*i.e.*, coal—is also mostly of German origin. The argument has been advanced, mainly from circles that are associated with the Standard Oil Company, that gas should be taxed in Germany because of the import duty on petroleum oil, which is referred to as "The Light of the Poor Man." But it has already been pointed out that the petroleum duty is for protective purposes; and it may equally well be argued that because there is a protective duty on, for instance, iron girders for constructional work, a duty should be put on timber, also required for building purposes, which the German forests supply.

There is yet another class of taxes—viz., those which are imposed in order to get revenue from any source quite irrespective of justification from a higher standpoint. To this class of taxes belong the salt-tax and the meal and meat taxes. A tax on gas would rank among this odious class of taxes. Gas undertakings have receipts which can easily be ascertained and drawn upon for taxation. That is the sole basis for the project, which stands entirely opposed to the best economical traditions of all civilized countries. It has always been a cardinal principle to leave free from taxation the raw materials and accessories of industry; and indispensable among the latter is fuel. This is expressly excluded from taxation in Prussia; but gas cannot be regarded as other than a fuel in a concentrated and perfected form. This has been constantly recognized by the Prussian Courts when attempts have been made by particular towns to introduce a tax on gas in order to ruin the private company supplying it. Gas is a century old; yet it has nowhere, or at any time, been taxed.

The English Parliament goes farther and stipulates that municipalities and companies must not charge too high a price for gas. In fact, the whole principle governing the supply of gas in England is that low prices are essential. The guiding principles in gas supply should be small capital charges, low cost of manufacture, large output, and small profits. Instead, therefore, of increasing the already high prices of gas in Germany by the addition of a tax, it would be better if the Legislature would endeavour to bring about a reduction in the price. Many German gas-works suffer from excessively high manufacturing charges. These could be considerably reduced if the initial cost of the coal, and the railway rates for the same, were reduced, and the duty on gas oil was removed.

The tax on gas may not appear objectionable to country people, because they imagine that it only concerns towns; but this point of view cannot long be maintained, because of the extension of the district of supply from gas-works through high-pressure mains. The Berlin gas supply extends over an area very nearly 20 miles across; and the German Continental Gas Company are now erecting in Silesia and in Saxony gas-works which are to supply whole tracks of country from single central works. There are already 1400 gas-works in Germany; and the number is increasing at a very rapid rate. Moreover, the expenditure of local authorities on public services has grown enormously, and many of them rely on making a moderate profit from the supply of gas. If the State puts a tax on gas, its price must either be raised by the amount of the tax or revenue obtained by the local authority from the supply of gas reduced.

The idea of a tax on gas has found favour largely because o the quite incorrect impression which prevails with the general public as to the profits which are made by gas-works. For instance, the newspapers report the annual profits of the Berlin gas undertaking at millions of marks; but they do not take account of the large capital which has been expended on the gas-works, which in Greater Berlin amounts to about £12,500,000. Interest at 4 per cent. on this capital would require £500,000 annually; while with 2 per cent. for depreciation, the annual charge would be half as much again. Notwithstanding the transition from manual labour to machinery which has taken place on gas-works, the large increase in capital expenditure involved in the installation of the machinery, coupled with dearer coal, has made it impossible to manufacture gas now so cheaply as formerly. The result, therefore, is that a smaller profit is earned upon an increased capital.

Apart altogether from municipal gas undertakings, the position of the gas industry in Germany may be grasped from the latest returns of a few of the private companies supplying gas. For instance, the last dividends paid by the following companies were at the rates per cent. per annum stated: The German Continental Gas Company, 8½; Magdeburg General Gas Company, 6; the Cologne Gas Company, 6; the Bremen General Gas Company, 5½; and the New Gas Company, *nil*. These dividends are very poor in comparison with many other industrial works. For instance, 113 mining and smelting works paid on the average in the year 1906, 11·6 per cent., and in 1907, 11·1 per cent. dividends; 284 iron and metal works paid dividends averaging 8·6 and 9 per cent. in the same years; and 391 banks paid 8·1 and 8 per cent. likewise.

"Monitor" next goes on to refer to the objection to a tax on gas from the hygienic standpoint. He compares the atmosphere of London, vitiated through coal smoke, with the atmosphere of Rome, which is free from all smoke except that of a few wood fires; and he points out that gas is being looked to as the agent by which, gradually, vitiation of the London atmosphere will be avoided. The combustion of gas produces no smoke, and the gas contains only a very small proportion of the sulphur of the coal; but gas can only be used freely as the heating agent in houses if it is cheap. It must be cheaper than it is at the present time in Berlin. Any increase in the price of gas through taxation will give coal an advantage in competing with gas as fuel, to the detriment of the hygienic conditions of towns. It is well known that the consumption of gas depends on its price. Some figures are quoted in support of this contention. Those for the year 1906-7 for eight towns of over half-a-million inhabitants are reproduced in the following table:—

—	Price of Gas per 1000 Cubic Feet.	Cubic Feet of Gas Consumed (exclusive of Public Lighting) per Head of the Population.
	s. d.	
Munich	5 2½	1341
Hamburg	3 11½	2790
Berlin	3 6	4450
Amsterdam	3 5	4310
London (North of the Thames)	2 10	6955
Liverpool	2/6½ (? 2/6 or 2/7)	5120
Manchester	2 4	8475
Glasgow	2 0	6075

The low price and high consumption of gas in English towns are remarkable. Although coal is cheap in England, electricity, which is the chief competitor with gas for lighting, benefits equally with gas thereby. Other figures quoted show that the reduction in the price of gas in Holland which has taken place in recent years has been followed by a very large increase in consumption; and in some Dutch towns the consumption per head of the population almost equals the English figures. The price of gas in Germany is, however, not nearly so low as in Holland and England; and consequently the consumption of gas is not nearly so high. Berlin alone of the large towns compares favourably in respect of gas consumption with English and Dutch places; but it must be remembered that the price of gas in Berlin is almost the lowest in Germany. Another table shows that in nine large towns of England, in which the average price of gas is 2s. 3½d. per 1000 cubic feet, the mean consumption per head of the population is 6565 cubic feet; while in nine of the large towns of Holland, the average price is 3s. 1½d., and the mean consupmtion 4310 cubic feet, whereas in nine large towns in Germany the price per 1000 cubic feet averages 4s. 1½d., and the consumption per head is 2682 cubic feet. It is evident that a tax on gas, by increasing its price, would tend to depreciate still more the consumption in Germany relatively to that of other countries.

"Monitor" concludes by summarizing the points which he has made—viz., that a tax on gas would not be a tax on wealth and luxury, nor would it be protective of home industry; it would be contrary to the spirit of the Prussian law, which does not allow of a tax on fuel; it would be injurious to a large number of growing industries; and it would be an interference with the sources of municipal revenue. Moreover, it would press most hardly on the small man who has been shown to be the chief consumer of gas; from a social and hygienic standpoint it is indefensible; while its imposition would inflict heavy damage on the gas industry and on the numerous manufactures dependent on it.

GAS AT THE FRANCO-BRITISH EXHIBITION.

THE Franco-British Gas Exhibition closed its doors upon the public on Saturday—after a six months' run, the greater part of which, from the points of view of public attendance, spectacular display, and pleasure-imparting provision, has been a success that it is impossible to describe in too vivid language. From the exhibitors' point of view, satisfaction is generally expressed, although not in all quarters, which could hardly be expected. Financially, however, there are rumours that the aid of the guarantors will have to be generously dipped into. With the close of this show unprecedented in this country, the question in the gas industry will be whether the Gas Section has also been the success that was prognosticated, or at all events was hoped for. Without qualification, we say that, as an advertisement on a sufficient scale to be popular and attractive to the ever-passing throng, it has fulfilled its mission. No one could have visited, as the writer has done, the Machinery Hall at all times during the course of the exhibition, and come to any other conclusion than that the public found in the suite of furnished rooms, in the culinary operations, in the laundry, in the industrial section, and in the making of mantles, a combination of interest that has been unrivalled by any other advertising display that could be classified with that of the Gas Section Committee. We know there has been a little disappointment that the industrial side of the display was not stronger; but that was not the fault of the Gas Section Committee. They had to plan according to the financial aid received; and, after the first and principal contributors, that "aid" came along from gas undertakings not with the spontaneity that might have been expected for such a cause, but at a pace and from numbers that savoured of a widespread reluctance. The Hon. Secretary of the Section (Mr. James W. Helps) must have felt, before he had finished, that begging for the advantage of the gas-supply industry was not the most congenial task that could be selected, nor a task that, for similar purpose, he would lightly undertake again without prior guarantee or promise that there would be a voluntary response of liberal order. The Gas Section, however, has spread in the industry a knowledge that did not generally exist before as to what such exhibitions cost. The cost of space and of erecting stands are not the only expenses entailed; the incidentals and running disbursements amount in the aggregate to a not inconsiderable sum. This is a point that some people have overlooked in connection with the Gas Section of the Exhibition. However, the Committee, in their prudence, cut their clothes according to their cloth; and we think we shall shortly hear from Mr. Helps that they have just about been able to make both ends meet.

There have, of course, been criticisms of the work the Committee have done. But opportunity on our part for hearing comment has been a fairly considerable one; and we are happy to say that the adverse critics have been few, while those who have commended have been many. The Chairman (Mr. H. E. Jones) and members of the Committee, and particularly the Hon. Secretary, have been in a position to judge better than anyone of the value of the section measured as an advertising scheme; and the view is that sanguine expectation has been met by full realization. The fact that 2000 to 3000 definite inquiries have been transmitted to three times the number of gas companies who subscribed to the funds for the exhibit speaks volumes as to success. This generous procedure on the part of the Committee in not confining the benefits of the display to subscribers to the funds makes manifest that they had but a single eye to the common advantage of the industry. No distinction whatever has been shown between subscribers and non-subscribers. Likewise, the communications that have been sent on to the various manufacturing firms whose goods were shown in the Committee's exhibit have contained specific inquiries to large number—in one case alone, to considerably over a thousand. It is evident, from all this, that much good has been done, and that the gas industry generally will profit. The section has shown that gas is available for all purposes from the delicately tinted and appointed drawing room and lady's boudoir, through house, shop, and factory, to street lighting and large open spaces; that it has (for its competitors) an enviable field in heating and cooking; that for power it is economical—even for the private generation of electricity. There has, in fact, been quite a revelation as to the range of uses for gas to multitudes of people. Not the least notable feature has been the Keith high-pressure lighting in the grounds, which disinterested folk have spoken of as bearing favourable comparison with anything that electrical competitors can do. There was one regret that the daily papers and the Exhibition authorites did not do much in assisting to advertise this outside gas lighting. The outlining of the buildings by small incandescent electric lamps seemed to have been singled out for notice, on account not of practical utility, but of the picturesqueness of the scene afforded through the unique setting given by the exhibition itself and the fanciful, ornate design of the buildings. It all appealed to the eye; and the practical side of illumination was largely forgotten, until the visitors were confronted by it prominently.

There is more to be said; but here acknowledgment must be particularly made of the indefatigable exertions of Mr. Helps on behalf of the Gas Section; and of the practical aid given by the Gaslight and Coke and Brentford Gas Companies. The Chief Inspector of the former Company (Mr. F. W. Goodenough) and his department rendered admirable service, particularly Mr. E. Pilbrow and his local staff. Mr. Pilbrow has had constant supervision of the section, and has won golden opinions for his attention and courtesy. Miss Sanderson, the lady demonstrator, too, has done exceedingly well in attracting attention to the culinary department. The experience gained at the Exhibition will be of material assistance in keeping gas demonstrations for advertising purposes up to the mark of modern requirement.

GAS USED DURING THE EXHIBITION.

Writers on the electrical side of the exhibition have testified over and over again to their defective vision during the last few months. They have been unable to find gas represented in the great show other than at the stand of the Gas Section Committee. They failed to discover the high-pressure incandescent gas-lamps brilliantly lighting a large area of the grounds; and they refused to recognize that no inconsiderable a part of the electric lighting in the exhibition was being generated by gas supplied by the Brentford Gas Company, with a connection for a supplemental supply (when needed) from the mains of the Gaslight and Coke Company. The glamour of the work electricity did in the simple decorative duty of outlining buildings and so forth blinded our electrical friends to the fact that gas was performing a no mean part in ministering to the pleasures of the visiting public and in serving many practical ends—industrially and for cooking for the multitudes.

That the business of gas supply to the exhibition was not of a kind to be contemptuously treated will be seen by the figure as to the approximate consumption during the run of the exhibition which has been obtained from Mr. Alex. A. Johnston, the Engineer and Manager of the Brentford Gas Company. The total is about 48 million cubic feet. Of course, the unpreparedness of the exhibition at the opening, and the bad effect this had for some weeks in restraining public attendance, did no good to exhibitors; and it certainly, for the time being, acted very detrimentally upon those who had business relations with the gigantic concern. Business commenced at a low level, and it took some weeks for it to rise to high-water mark. In the case of gas, during the past two months, the average consumption per day has been some 400,000 cubic feet, which will be conceded to be a pretty big quantity for one customer, regarding the exhibition as such. Of course, rather more gas per day has been wanted during these two months for lighting purposes, but a very considerable part of the increase has been required for cooking and power purposes. If the average quantity mentioned had run through the entire exhibition, the total consumption would have been in the 156 days about 62½ million cubic feet. During the exhibition, nearly 2 million cubic feet were used through the Gas Section for the purpose of demonstrating the uses of gas; but that is a very small proportion of the total consumption in the exhibition.

It will be remembered that the gas was supplied to the exhibition authorities through two large meters, and then retailed by them. We are in a position now, through Mr. Johnston's courteous assistance, to give a complete list of the meters fixed in the exhibition, and the purposes for which the gas was utilized. The large amount of gas that was required for purposes other than lighting will be particularly noted.

Name.	Size of Meter.	Particulars of Use of Gas.
Australian Section	One 1000-light	For Westinghouse engine to generate electricity.
Canadian Section	One 1000-light	,, ,,
Crossley's Ltd.	One 400-light	Gas-Engines.
"Daily Mail"	One 200-light	Metal melting.
Irish Village	Two 100-light	Heating urns, hot-plates, and making potato crumpets.
Indian Pavilion	One 100-light	Illumination.
Lipton's	One 150, one 50, one 80 light	Generating current, heating boilers, exterior lighting.
Lipton's, Ceylon	Two 500, one 60 light	Generating power, exterior lighting, cooking.
Lyons	Six 100, eleven 50, one 80, one 60, four 30, two 20 light	Cooking, heating water, and lighting.
Gas Exhibit	Two large meters in Machinery Hall.	
Bovril, Ltd.	One 30-light	Heating, boiling, and lighting exclusively by incandescent gas.
Scenic Railway	One 250-light	Power purposes.
Spiral Railway.	Three 100-light	Power purposes.
Toboggan Railway		
Spiders Web		
Souks Tunisian Arcade	One 100, one 50	Lighting by incandescent burners.
Palace des Colonies	One 20-light	Illumination.
Lavatories throughout, Police Offices, Attendants, and Ambulance Stations	Exclusively lighted by gas.	
Old London	One 20-light	Lighting.
Maynards	One 20-light	Heating, boiling, and exclusive lighting.
Paillards	One 80-light	Cooking purposes.
Algerian Restaurant	One 20-light	Cooking.

Name.	Size of Meter.	Particulars of Use of Gas.
Buisson Hella . . .	One 60-light	.. Exhibiting mantles at their Kiosk.
Westinghouse Power Company	One 20-light	.. Power purposes.
Lambs Pump Syndicate	One 30-light	.. Power purposes in Machinery Hall.
Brays, Ltd.	One 50-light	.. Exhibiting incandescent mantles.
M'Vitie and Price . .	One 20-light	.. General lighting and cooking.
Laddite Mantle Company	One 20-light	.. Incandescent mantles and fittings.
J. Cameron & Co. .	One 20-light	.. Power purposes in Machinery Hall.
British Oxygen Company	Gas for brazing and welding purposes.	

Sixty other small meters of various sizes were also in use in the grounds.

This is an interesting list to have on record, showing as it does the numerous purposes to which gas was applied in the most popular exhibition that there has ever been in this country.

An Appeal from the Deutsches Museum.

The Council of the Institution of Gas Engineers, at their meeting last Thursday week, had before them a letter signed by Dr. O. Miller, the President of the Deutsches Museum, at Munich, and Dr. E. Schilling, in which it is pointed out that the museum has (like the Kensington Museum) undertaken to demonstrate the development of the natural and technical sciences, from the beginning up to their present position, by means of original specimens, apparatus, models, and drawings. The writers point out that a specially important epoch in the groups of "Illumination" and "Gas Engineering" is marked by the invention and introduction of gas for lighting purposes in England; and they state that they would be greatly indebted for "data or material concerning the first stages of gas engineering in England, if possible in the form of drawings and of descriptions of the oldest gas-producing plant of Murdoch and Clegg, such as was used in the factory of Messrs. Boulton and Watt, at Clegg's country house at Redruth, and at Ackermann's in London." Any information on these points, and also the temporary loan of drawings or MSS., would be of the greatest value to them. With reference to "Illumination," they wish to acquire one or two gas-chandeliers, for interior lighting, dating from the beginning of the Nineteenth Century, and ask whether characteristic specimens of this period still exist in England. As it is not in the power of the Council to send drawings, descriptions, &c., for the purposes named, we are asked to make the contents of the letter known, so that readers able to offer any help may communicate with the Institution.

Presentation to Mr. Isaac Carr.

A private function of considerable interest in Widnes took place at the last monthly meeting of the Gas and Water Committee of the Corporation—the celebration by Mr. Isaac Carr, Gas and Water Engineer, of his silver wedding being marked by the presentation to him of a solid silver salver by the members of the Committee. It bore the following inscription: "Presented to Mr. and Mrs. Isaac Carr, on the occasion of their silver wedding, by the members of the Gas and Water Committee of the Corporation of Widnes, as a token of their appreciation of the long and valuable services rendered by Mr. Carr. Alderman H. S. Timmis, J.P., Chairman, Alderman J. W. Wareing, J.P., Deputy-Chairman. September 4th, 1908." Alderman Timmis, the Chairman, handed Mr. Carr the salver, and congratulated him on the attainment of so happy an anniversary. He said that when the knowledge of the event came to the Committee, there was a unanimously expressed desire to bear testimony to the long and much-valued services Mr. Carr had rendered in the department under his control. They recognized the very marked progress the gas and water undertakings had made under his management, which had extended over the whole of his married life. It afforded him (Alderman Timmis) sincere pleasure to ask Mr. Carr's acceptance of the Committee's gift, and to express their hearty wishes for his future happiness and prosperity. Practically every member of the Committee spoke in eulogistic terms of Mr. Carr's services; special emphasis being laid on the fact that his skill and wide technical knowledge had on several occasions obviated the necessity of calling in an expert. Mr. Carr, in responding, said the Committee's gift came as a great surprise to him, for he had never anticipated anything of the kind. During his connection with the Gas and Water Departments, it had been a pleasure to him to do his best; and he was indeed pleased to find that these efforts were considered worthy of appreciation. He valued the gift more especially because he understood that it came spontaneously from the whole of the members of the Committee; and he could assure them both Mrs. Carr and himself would always place a high value upon it.

According to a recently issued Statistical Abstract of the United Kingdom, the total outstanding loans of local authorities at the end of the financial year 1905-6 amounted to £564,645,200—an increase since 1883-4 of £371,649,327. The indebtedness of England and Wales in 1905-6, which was £482,983,929, includes £47,438,852 in respect of loans of the Metropolitan Water Board.

AUTOMATIC STREET GAS-LAMP LIGHTING.

An Invention from Australia.

It is not frequently that we have to chronicle from our Colonies invention relating to gas supply; and when we do, if judgment bestows upon the invention merit that individualizes it, hearty welcome is accorded. Lately, on two separate occasions, there has been under inspection another addition to automatic lighting arrangements for street lamps, about which newcomer novelty is found. It is the invention of Mr. George Robson, of Melbourne, with whom, in exploiting the invention, is Mr. J. Crawford Hiscox, also from Australia. In Melbourne the new automatic lighter has been under trial, and has discharged its functions in a manner that commends, and has gained for it an excellent character for reliability.

This lighter is different from all ordinary known ones, in that it incorporates a little simple mechanism, and is actuated by what the inventor describes as a "wave" of pressure. These characteristics distinguish it from the ordinary appliance operated by clockwork, by which lighting and extinguishing is set for a definite time, with the necessity for time-adjustment to each lighter at intervals; such arrangements being therefore purely under mechanical control. In this new invention—the appliance, by the way, is known as the "Automaton"—there is a small clockwork machine the actions of which are entirely under the control of the officials at the gas-works. It is in short a combination of both the clockwork and the pressure systems of lighting and extinguishing. The clockwork is essentially a motor, energized by a spring, and working only when turning on and off the gas-cock. A "wave" of pressure is sent along the mains, and inflates a

The "Automaton" Lamplighter in Parkinson and W. & B. Cowan's No. 840 Pattern Street Lamp.

weight-controlled diaphragm, which starts the mechanism; and simultaneous lighting and extinguishing of the gas-lamps throughout a district is effected. A very simple device in connection with the weights obviates any possibility of the apparatus being operated by accidental variation of pressure; so that, when once the gas is lit, it cannot be accidentally extinguished, and when extinguished it cannot be accidentally lighted.

There is no occasion to go with any detail into the construction of the lighter. The illustrations will show the simplicity of the mechanism, and that, when cased in, the whole arrangement is not of a character that looks unsightly in the lantern, whether in the vertical or the horizontal form. The latter, if anything, is the smaller of the two; but neither pattern is of such size that any question of shadow arises. A comparison of the space occupied by a lighter in an ordinary lantern, as shown by our first illustration, will satisfy curiosity on the point.

This being so, we may proceed at once to consider certain advantageous features that the new lighter and extinguisher suggests on examination. The clockwork is found to be of simple design, and strongly and substantially made; and—mark this as important—as it is only at work for a few seconds at lighting-up time and at the time of extinguishing the lamps (certainly not totalling more than a minute a day), the life of the apparatus should be practically unlimited. This is a feature that will no doubt be strongly urged in seeking to make a commercial position for the new device in rivalry with constantly running clockwork. It is certainly open to claim that the wear and tear on the apparatus will be at the lowest possible point. A further advantage associated with this consideration is that, as the appliance is only working for a few seconds each day, it does not require winding and adjusting every week or so, but will work for several months

The "Automaton" Lamplighter in Parkinson and W. & B. Cowan's No. 160 Pattern Street Lamp, Illustrating Cluster Lighting.

without being wound. Then again the minimum in labour for such an appliance is reached. The control from the gas-works, too, enables the street lamps to be lighted and extinguished at any time just as required; and in this peculiar climate of ours, when almost sudden fogs arise to cause the reign of a general discomfort, there can be an amelioration of the trouble in our streets by one move and instantaneously by the simple action required at the gas-works. As a matter of fact, though people have not thoroughly realized the convenience yet, the actuation by pressure arrangements of street lamps gives to gas the convenience formerly possessed by electricity, of an immediate availability without having to dispatch a company of men from the works to light up the lamps individually. But unlike electricity, if there is failure at all of the lighting in the case of gas, it only applies to single lamps; with electricity, failure sometimes involves the streets of whole districts.

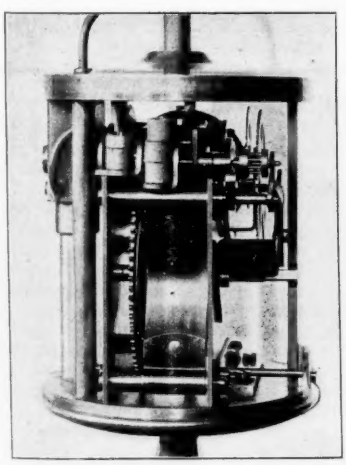
Now, from the general to the particular again. We find that, when fixed, no vibration can possibly operate the "Automaton" apparatus. It is also observed that there is no contact of the mechanism with the gas, so that there is no clogging of the movements. While, too, the apparatus has its own specially designed bye-pass gas-cock, it will operate any description of bye-pass tap, and is applicable to any burner or cluster of burners, inverted or otherwise, in fixed or swing lamp. There is no question as to the ease of fixing; and there is no obvious reason why the apparatus should not be placed outside the lantern as well as inside. This could be done without alteration to the frog or cradle.

With regard to the pressure required to actuate the new lighting and extinguishing apparatus, its range is only small—say, ½ inch; and this is a matter that brief consideration will show is of some importance. To cause the appliance to work at any pressure desired, the only adjustment of the apparatus that is needed is the placing of small weights on the diaphragm levers. Now let us assume that the day pressure is 30-10ths, the evening pressure 40-10ths, and the midnight pressure 15-10ths. When it is desired to light the lamps, the pressure is raised to 45-10ths (5-10ths above normal), at which point the mechanism becomes engaged ready to operate. The pressure is then lowered to normal evening pressure, 40-10ths, and the mechanism operates to turn the tap to the "on" position. In the morning, when it is desired to extinguish the lights, the pressure is raised from the night pressure 15-10ths to 30-10ths; then brought back to 25-10ths. The apparatus at once operates, and the light is extinguished—the pressure then being brought to the normal point. The range of pressure between lighting and extinguishing may, as mentioned previously, be varied by merely changing the weights controlling the diaphragm.

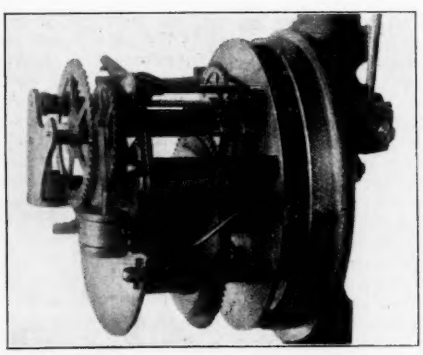
With regard to the effects of the manipulation of the pressure in the manner described, the operation of moving the plug of the gas-cock takes about 35 seconds; but, as soon as it is started, the gas passes to the burner, and is ignited by the pilot-flame—the latter being extinguished when the plug is fully turned through 180°. Thus in the operations of lighting and extinguishing, the burner and pilot gas are burning together for the space of 30 seconds only. This, however, gives ample time to ensure the one being lit before the other is extinguished.

The appliance can be adapted for all desired forms of control. For instance, in cluster lighting, provision has been made for extinguishing all but one of a cluster of burners at any hour of the night, and the remaining burner of the cluster at the usual hour in the morning, or whenever desired. In the illustration of the lighter in Parkinson and Cowan's No. 160 pattern street lamp, there is a cluster of five burners which are all lighted at dusk. But on a reduction of pressure at midnight, four are extinguished; and the centre burner is extinguished at daybreak. Again, the street-lamps of one suburb may all be extinguished at midnight, while the lights of other suburbs are extinguished at daybreak; or every alternate lamp may be extinguished at midnight, and the others in the morning.

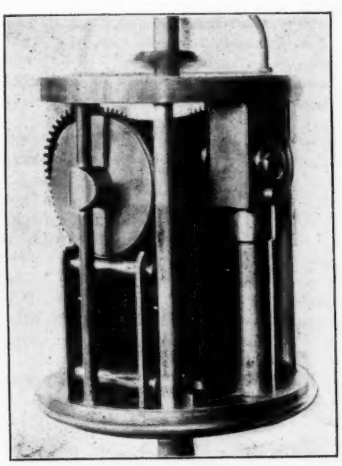
With respect to the economies of automatic lighting, these have to be contrasted with initial and maintenance expenses; and the new appliance will no doubt, from what has been seen of it, justify itself in this regard. Convenience of immediate lighting up and extinguishing is also of value, and should be taken into account in these days when the advantageous "points," apart from expense, of rival systems of lighting are made much of in the ears of the public lighting authorities.



Vertical Shaped "Automaton," with Cover off, Showing the Mechanism and the Weighted Levers controlling the Diaphragm.



Horizontal Shaped "Automaton," with Cover off, Showing the Mechanism.



Vertical Shaped "Automaton," Showing the Tap and Diaphragm.

Recent Wills.—The late Mr. A. H. Godwin, who was for upwards of forty years Manager of the Watford Gas-Works, left estate of the value of £7563. The late Mr. Henry Green, of Preston, whose death was recorded in the "JOURNAL" for Sept. 1, left £10,480. Mr. John Clapham, of Keighley, left £8701. Mr. H. A. Bishop, one of the Directors of the Ilford Gas Company, left £17,863.

Scottish Junior Gas Association (Western District).—An ordinary meeting of the Western District Section of the Association will be held in the Glasgow and West of Scotland Technical College next Saturday evening, under the presidency of Mr. A. H. Whitelaw, when Mr. J. F. Harrison, M.Inst.C.E., will read a paper entitled "Steel Work, Illustrated by the Erection of the Forth Bridge."

COAL STATISTICS FOR 1907.

Another Record Output.

WHAT is certainly, from a national standpoint, one of the most important of the annually issued Government Blue-Books is Part III. of the Home Office Report on Mines and Quarries, which gives full particulars with regard to the output and value of the minerals raised in the United Kingdom, the amount and value of the metals produced, and the exports and imports of minerals. The statistics for 1907 were recently published; and in view of the large demand that existed during that period for coal, and the high prices realized, the information they furnish will no doubt be studied even more closely than usual.

As remarked, coal was last year in great demand, and the output once more established a record. The total quantity raised was 267,830,962 tons, of a value at the mines and quarries of £120,527,378—the figures for 1906 being 251,067,628 tons, of a value of £91,529,266; and for 1905, 236,128,936 tons, of a value of £82,038,553. Thus there was an increase last year over 1906 of 16,763,334 tons in the output, and of £28,998,112 in the value. This increase in value is, of course, not by any means entirely accounted for by the larger quantity of coal raised; the average price per ton realized—9s., as against 7s. 3·49d.—having had a great deal to do with the matter. The growth in the output, however—particularly as it follows a series of years of large increases—is of itself of a remarkable character, as will be gathered from the following figures of the output for the past six years: 1902, 227,095,042 tons; 1903, 230,334,469 tons; 1904, 232,428,272 tons; 1905, 236,128,936 tons; 1906, 251,067,628 tons; and 1907, 267,830,962 tons. The value of the coal at the mines for each of the past five years has been: In 1903, 7s. 7·93d.; in 1904, 7s. 2·58d.; in 1905, 6s. 11·38d.; in 1906, 7s. 3·49d.; in 1907, 9s. Thus even 1903, to say nothing of the three following years, was left far behind by the average price realized during 1907.

As regards the increase of 16,763,334 tons in the output last year, by far the greater part was raised in England—12,393,387 tons—though Wales (with an increase of 2,263,726 tons), Scotland (with an increase of 2,100,179 tons), and Ireland (with an increase of 6042 tons) did at least as well proportionately. The total output in England was 187,386,517 tons, in Wales 40,252,193 tons, in Scotland 40,092,548 tons, and in Ireland 99,704 tons. As usual, the term "coal" in these statistics includes anthracite, the total output of which in 1907 was 3,850,437 tons, having a value of £2,308,259. This item also shows an increase on the previous year, when the output was 3,377,523 tons, of a value of £1,522,437. Of the total supply of anthracite, about three-quarters is derived from Carmarthen and Glamorgan. Scotland and Ireland are credited with a small output, but England with none. As to the prices of coal per ton at the pit's mouth in the different fields, it may be remarked that these were last year as follows: Scotch coalfields, 8s. 10·12d.; northern, 8s. 8·53d.; Yorkshire, &c., 8s. 0·63d.; Lancashire and Cheshire, 8s. 5·67d.; Midland, 7s. 8·77d.; small detached coalfields, 9s. 3·83d.; North Wales, 7s. 10·74d.; South Wales, 11s. 7·13d.; Irish, 9s. 4·41d. The average price per ton was for England 8s. 5·48d., for Wales 11s. 8·27d., for Scotland 8s. 10·12d., and for Ireland 9s. 4·41d.; while, as stated above, over the whole of the fields it was 9s. per ton. The average price in the London market was 19s. 9d. per ton in 1907, as compared with 15s. 9d. in 1906, 15s. 6d. in 1905, 15s. in 1904, 15s. 10d. in 1903, 18s. 1d. in 1902, 19s. 5d. in 1901, 22s. 9d. in 1900.

The quantity of coal exported (exclusive of coke and patent fuel, and of coal shipped for use by steamers engaged in foreign trade) was 63,600,947 tons, or an increase of more than 8 million tons over 1906, when the amount was 55,599,771 tons. In 1905 the figure was 47,476,707 tons; and in 1904, 46,255,547 tons. The declared value of last year's exports of coal was £40,170,296, and of those of the preceding year £30,069,307. In addition to this, there was in 1907 the equivalent of 1,635,697 tons of coal exported in the form of 981,418 tons of coke, and of 1,332,804 tons in the shape of 1,480,893 tons of patent fuel. If to this be added the 18,618,828 tons of coal shipped for the use of steamers engaged in foreign trade, we have a total quantity of coal and coal equivalent shipped of 85,188,276 tons. The declared value of the exports of coke was £856,969, and of patent fuel £1,091,729. The coal equivalents are ascertained by assuming that for every 60 tons of coke exported, 100 tons of coal were consumed in its manufacture. The patent fuel exported is computed to contain 90 per cent. of coal; the remaining 10 per cent. consisting mainly of pitch. If we look at the list of the countries to which coal was exported—which is perhaps one of the most instructive features of the returns—it is found that our three largest customers remain the same, though their position in the list varies, from year to year. In the year 1907, France took 10,694,136 tons of coal, of a value of £6,297,659; Germany, 10,107,877 tons, value £5,433,497; and Italy, 8,317,637 tons, value £5,505,485. These figures are for coal alone; but in the case of France and Italy they would be increased by over 200,000 tons by the addition of the coke and patent fuel. The coal exported to these three countries in the two preceding years was as follows: 1906—France, 9,444,528 tons; Italy, 7,810,024 tons; and Germany, 7,629,653 tons; 1905—Germany, 7,626,377 tons; France, 6,731,655 tons; and Italy, 6,412,686 tons. Thus the recent increase in both French and German requirements has been remarkable; but whereas in 1906 France jumped up nearly 3,000,000 tons, last year it was Germany's turn to purchase about 2,500,000 tons more. Imports of "coal, culm, and cinders" into the United Kingdom, which are always insignificant, showed a drop last year which seems to threaten their early extinction as a feature of the report. The total quantity in 1907 was only 18,834 tons, compared with 48,943 tons in 1906; and the value £20,845, against £47,100. Practically speaking, the whole of the imports were from the Netherlands—18,256 tons; the smallest amount specifically mentioned being 2 tons from Japan (including Formosa). After meeting all the requirements from abroad, there remained of the total output of 267,830,962 tons of coal 182,642,686 tons for home consumption for all purposes; and reckoning the population of the United Kingdom at 44,098,727, this represented a quantity of 4·142 tons per head, which is more than in any other year included in the tables—and these go back to 1873.

In accordance with a suggestion made by the Royal Commission on Coal Supplies, the returns for 1905 and 1906 contained particulars with reference to the manufacture of coke and briquettes in the United Kingdom; but as there were no compulsory powers of obtaining the information, it was pointed out that the statistics were not necessarily complete, though they were regarded as approximately correct. Now, however, these figures are being collected by the Census of Production Department; and as they have not yet been compiled, the details for 1907 will appear in the Census of Production Returns, which will be issued at a later date by the Board of Trade.

In conclusion, a brief glance may be taken at particulars contained in the report under review with regard to the output in the United Kingdom last year of other materials than coal. Both the output and the value of the bog ore raised in Ireland last year once more show an increase; the figures being: 1907, 6290 tons, of a value at the open works of £1573; 1906, 5425 tons, value £1356; and 1905, 3205 tons, value £801. In 1897, the last year in which the amount was greater, the output was 7124 tons, and the value £1781, though in 1891 the output was much greater—16,075 tons, and the value more than proportionately higher, at £8037. The output of iron ore last year was 15,731,604 tons, of a value of £4,433,418. This was 231,198 tons more than in the preceding twelve months. With reference to natural gas, the statement in the report is so brief that it may be quoted in full—especially in view of the renewed attempts recently made to interest the public in this as a source of supply for domestic consumers: "Natural inflammable gas was discovered at Heathfield, in Sussex, some years ago, when a hole was being bored with the object of obtaining water. During the year 1904, the amount of natural gas obtained at Heathfield was 774,800 cubic feet, valued at £155; but none has been obtained since." Petroleum also fails to have anything to its credit, so far as output in the United Kingdom is concerned, in the present report; but in 1906 the amount was only 10 tons. The imports of petroleum into this country, on the other hand, always, of course, reach large figures. Last year the imports were 304,134,482 gallons, of a value of £6,067,285, as compared with 299,220,607 gallons, value £5,845,059, in 1906. The sources were: Russia, 35,853,232 gallons; the United States, 220,252,858 gallons; and other countries, 48,028,392 gallons. Russia again shows a falling off, and the United States a more than corresponding increase. In fact, the 35,853,232 gallons imported from Russia is really insignificant when compared with the figure of 129,599,066 gallons in 1904, though under the circumstances the large decrease is not a matter that would take anyone by surprise. The value of last year's imports was: From Russia, £680,906; from the United States, £4,259,061; and from other countries, £1,127,318.

Papers at the American Gas Institute Meeting.

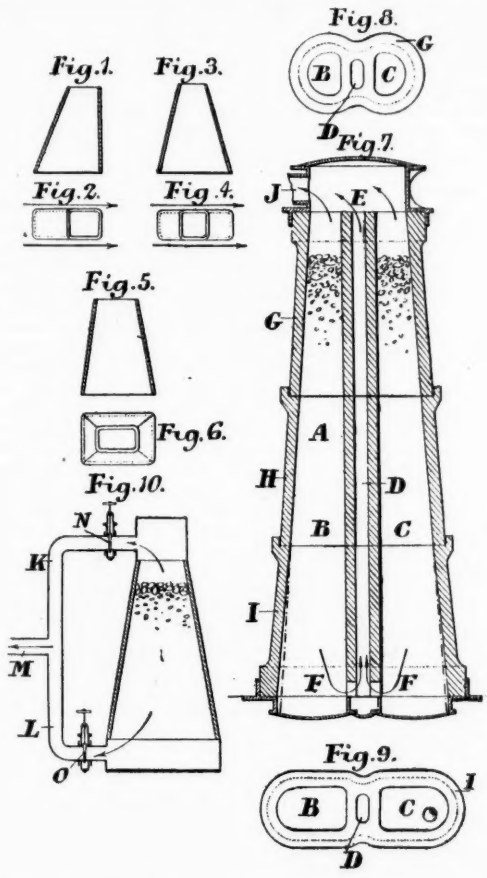
In the "JOURNAL" for the 13th ult. (p. 124), we gave a list of the papers and reports to come before the members of the American Gas Institute at the third annual meeting fixed to be held in New York from the 21st to the 23rd of last month. We have received advance copies of them, and shall deal in due course with those which possess most interest for our readers; but as they are all subject to revision and approval by a Board of Directors of the Institute, this cannot yet be done. A correspondent in the States, writing to us on the subject of the meeting, says: "Matters connected with gas manufacture and distribution are not now, as they were in recent years, the exclusive property of any nation; and in the great union of English-speaking people across the Atlantic, there is to be found a community of interests which it is very desirable to continue to foster. By an interchange of ideas presented by the best men on either side, much that is useful can be adopted with facility and absence of costly experiments, in the shape of new methods and improvements in old ones."

Junior Institution of Engineers.—At the recent annual general meeting of the Association, the Council reported that Mr. James Swinburne, F.R.S., had been elected President, in succession to the late M. Gustave Canet. Nine meetings for the reading and discussion of papers were held in the past session; and 38 visits were paid to engineering works. There was a successful summer meeting in France. Among the awards was a bronze medal to Mr. Gilbert Whalley, for his paper on the "Testing of Gas-Engines," which was noticed in the "JOURNAL" for the 25th of February last. Mr. F. R. Durham is Chairman of the Council for the current session.

INTERMITTENTLY CHARGED VERTICAL RETORT.

The Compagnie pour la Fabrication des Compteurs et Matériel d'Usines à Gaz have taken out a French patent for an intermittently charged vertical retort suitable for the manufacture of coal gas. The specification is given in the current number of the "Journal de l'Éclairage au Gaz," from which the following particulars have been translated.

Vertical retorts of the Appolt type hitherto in use have been found to be unsuitable for the manufacture of illuminating gas, for the following reasons: (1) The distillation of the coal occupies a longer time than in horizontal or inclined retorts; (2) during the first portion of the distillation period the pressure of gas is much greater at the bottom than at the top of the retort; and (3) the illuminating power of the produced gas is lower than in the case of horizontal or inclined retorts, even with the same kind of coal. The first drawback is due to the fact that retorts of the Appolt type must be sufficiently tapered to ensure the automatic removal of the coke; and this necessitates making the retorts too wide at the bottom to distil the coal as quickly as is done in the two other kinds named. The second disadvantage arises from the coal becoming very soft during the earlier portion of the distillation process, so that the gas given off at the base must acquire great



force in order to pass through the mass of pasty coal before reaching the top of the retort. The third inconvenience attending the working of these retorts is due to the circumstance that, during the final hours of distillation, the gas produced in the lower part of the retort rises through a mass of incandescent coke several feet high. When distillation has been completed, the gas really makes its way through the coke already formed near the sides of the retort, which offers but slight resistance to its passage, and does not go through the centre of the uncarbonized coal, as this pasty mass is an obstruction. The illuminating hydrocarbons of the benzol series are consequently decomposed into non-illuminating gases on coming into contact with the incandescent coke; and it is precisely these hydrocarbons which impart to the gas its illuminating power and ensure its commercial quality.

To remedy the first of the above-named defects, all that is necessary is to make the retorts slope on one side only, or on two opposite sides, as shown in the accompanying diagrams.

Figs. 1 to 4 are vertical sections and plans of retorts constructed on the principle described; and figs. 5 and 6 show an Appolt retort as actually made. It will be seen that in figs. 1 and 2 the retort has a slope in one direction only, on one side; whereas in figs. 3 and 4 the slope is in one direction but on two sides. The other sides are vertical, or practically so, which gives them the same transverse width over their entire height. The produced gases consequently have to flow in the setting parallel to the two vertical sides of the retorts, in the direction shown by the arrows in figs. 2 and 4.

In order to remedy the two other defects mentioned, all that is necessary is to draw off the gas from the retort at its base and top. Figs. 7 to 10 show two modifications in the construction of retorts to allow of this being done. In the vertical retort shown in elevation in fig. 7 (the top and bottom of which are shown in plan in figs. 8 and 9), the gas is drawn off at the mouthpiece, and at the bottom by a central tube which conveys it to the top. The retort A consists of two chambers B C and the central tube D, which is open top and bottom. The gas issues from the mouth of the retort E in the direction of the arrows, and at F at the bottom. The two chambers B C, which are closed by unluted doors, are filled with coal and emptied once for all. The retort has a slope in one direction only, and is formed of three sections G H I. The batter of the first two is the same, but that of the third is greater, in order to facilitate the removal of the coke. As, owing to its position, the central tube collects the gases, great pressure at the base of the retort is prevented; and the gas produced there is withdrawn from the decarburizing influence of the incandescent coke and the highly heated sides of the retort. The tube might also be perforated over its entire length, so as to convey the gas from the retort uniformly. The take-off pipe J might be branched on the bottom instead of the top. The flow of the gas would then be in the opposite direction to that shown by the arrows. It would also be possible to extract the gas simultaneously from both top and bottom, as shown in fig. 10, by branching, at both ends of the retort, pipes K L, which unite to form a single lateral pipe M, situated outside the setting, and acting in the same way as the central tube D (fig. 7).

Retorts constructed in the way indicated can be utilized for the manufacture of a mixed gas—either coal gas with poor gas produced by introducing air into the retort, or coal gas mixed with water gas manufactured by conveying steam or simply water into the retort. In the case of vertical retorts having a central tube, the conveyance of air, steam, or water would be effected at the lower part of the retort if the gas produced were drawn off at the top, and at the top when the gas was extracted at the bottom. In the case of vertical retorts with two gas outlets and a lateral tube, as shown in fig. 10, the air, steam, or water could be introduced either at the bottom or the top, by simply manipulating the valves N O in the outlet-pipes K L.

IMPROVED FITTINGS FOR GAS-HEATED STEAM RADIATORS.

We have received from Messrs. John Wright and Co., of Birmingham, the following particulars of important developments in their "St. Andrew" radiator. As the result of thorough and prolonged experiments, this apparatus was so completely perfected before it was first put on the market, that no radical improvements have since been called for. The latest product of the firm is therefore, in all its leading features, identical with the first "St. Andrew" radiator sent out five years ago.

Messrs. Wright and Co. have always recognized the grave objections attached to the use of packing and jointing material in assembling radiator loops, owing to the perishable nature of such material, and the consequent certainty of leakage sooner or later. They have therefore, from the very first, made a point of not using any other than a purely metal-to-metal joint. Hitherto they have used steel push-nipples, like those employed in the manufacture of circulating radiators; and these have served their purpose admirably—not a single complaint of corrosion or leakage having been reported. For some time past, Messrs. Wright and Co. have aimed at a still further development, and have been engaged in designing and testing plant with a view of enabling them to manufacture a push-nipple of malleable cast iron; and having at length completely succeeded, they are now sending out all their "St. Andrew" radiators assembled in this way. Gas engineers will at once recognize the great advantage which is marked by this invention. The nipple and radiator being of the same material, equal expansion and contraction is secured; while the nipple being of cast iron is as incorrodible as the radiator itself, so that the new invention adds even more to the already long life of the "St. Andrew." At the same time, the malleable quality enables the nipple to be made of greater thickness, while retaining all the elasticity that has secured the absolutely tight joint which has been characteristic of the steel push-nipple. The use of malleable push-nipples is exclusively confined to the "St. Andrew" radiators; the machine for producing the nipples being the sole invention and property of the firm.

Messrs. Wright and Co. have also invented, and are manufacing a new air-valve, as well as an improved water-gauge; and these, it is anticipated, will further enhance the wide popularity of the "St. Andrew."

The new air-valve (fig. 2, p. 336) is much more compact and neat in appearance than the old pattern (fig. 1), and is even more effective. The thermostatic plug extends right inside the radiator loop, and so is extremely sensitive to the temperature of the steam. The steam that issues immediately after lighting up is condensed in a channel formed in the valve-head, and the condensed water is afterwards evaporated by the heat of the radiator, so that rust is quite prevented. The old-pattern valve is also of

Wright and Co.'s own invention and manufacture; and in addition to fitting them to their radiators, they have for some time past supplied them extensively to the trade. This they purpose continuing to do; but they intend to reserve the new type of valve absolutely for their own use, and it can only be had fitted to radiators of this firm's make.

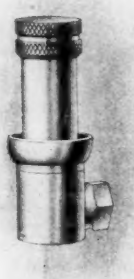


Fig. 1.

Fig. 2.

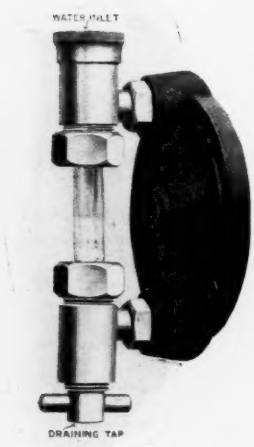


Fig. 3.

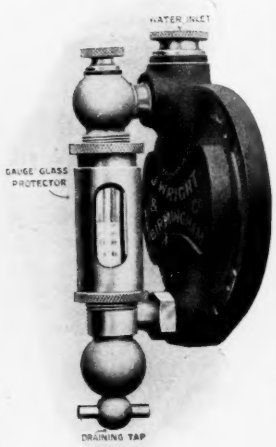
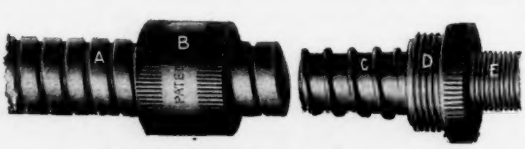


Fig. 4.

The new water-gauge has been designed so as to entirely separate the filling aperture from the water-gauge. The illustration (fig. 4) shows how well this object has been attained. The filler is fitted with a dust-proof cap; and the gauge-glass is protected by an improved nickel-plated steel protector. Fig. 3 shows the old pattern water-gauge. Every part of the "St. Andrew" radiator is now practically indestructible—thus greatly increasing economy of upkeep.

A CONNECTOR FOR FLEXIBLE TUBING.

The accompanying illustration is self-explanatory of a patent nozzle for use with metallic flexible tubing, which is the invention of Mr. John E. Singleton, of Clark Road, Wolverhampton.



Singleton's Flexible Tubing Connector.

Having in view the large number of gas appliances with which such tubing is utilized, it will be recognized that there is a wide field for such an arrangement as is here shown, which enables a connection to be rapidly made. The *modus operandi* is simplicity itself, as will be gathered from the following brief reference to the lettering on the illustration. To obtain a gas-tight joint, slip the cap B over the metallic tube A, then insert the taper spiral thread C into the tube and rotate till the end of the tube presses against the butt end of the thread D. After this, screw the cap B tightly home in the thread D. The taper spiral thread C is so formed as to slightly expand the tubing when screwed into it; and the result is an efficient joint. The male end E is $\frac{3}{8}$-inch brass, so as to take all injector nipples of inverted burners, as well as small gas-ring and griller nozzles. It may be remarked that stocks of the connectors, which are made of brass, in different sizes, are carried by Messrs. J. & W. B. Smith, of Farringdon Road, E.C.

WATER ACTS FOR 1908.

[Concluding Article.]

The following are the remaining Acts conferring upon Local Authorities further powers in regard to the supply of water.

The Leicester Corporation Act sanctions an extension of the limits of water supply so as to include a number of parishes, townships, and places in the county of Leicester; and a period of six years is granted for furnishing the supply. The Act contains provisions for the sale of portions of the water-works plant to other sanitary authorities whose districts are beyond the Corporation's limits, and for enabling the latter to acquire by agreement any existing sporting and fishing rights over their Thornton, Bradgate, and Swithland reservoirs. Power is given to increase the water-rates to the extent of £2 10s. per cent. per annum on the rateable value of the premises supplied. [*Parliamentary Agents: Messrs. Dyson and Co.*]

The Lincoln Corporation Water Act confers various further powers upon the Corporation with respect to their water undertaking, and authorizes them to construct additional works and extend their limits of supply. The new works comprise a well and pumping-station in the parish of Elkesley, in the rural district of East Retford, and two aqueducts or pipe-lines and an approach road in connection with it—all to be completed within seven years from the passing of the Act. The limits as extended include several places in the Parts of Lindsey and Kesteven, in the county of Lincoln. As from April 1, 1909, the rates to be charged for a supply of water for domestic purposes are not to exceed 15 per cent. within and 20 per cent. beyond the city, and are to be based on the annual rateable value of the premises. But the rate in the outside area is not to be more than 5 per cent. above that charged for the time being within the boundaries. Closets after the first are to be liable to a charge not exceeding 7s. 6d. per annum, and every fixed bath not holding more than 50 gallons a maximum of 5s. per annum. The price of water supplied by measure is not to be more than 1s. 6d. per 1000 gallons. The Act contains a number of protecting sections. The Corporation asked in their Bill for power to borrow £180,000, to be repaid in sixty years; but they have been granted £193,000, with a reduction of ten years in the period for repayment. [*Parliamentary Agents: Messrs. Tahourdins and Hitchcock.*]

In a General Powers Bill promoted by the Liverpool Corporation, they sought to be relieved of the obligation to supply water to the Corporations of St. Helens, Warrington, and Widnes, under existing agreements, if no demand for it had been made at the expiration of three years from the 1st of January of the present year. These clauses, however, do not appear in the Act. They also wished to have the provisions of their Acts of 1862 and 1866 repealed, so that it would not be compulsory to supply water on the constant system and at high pressure. It is now enacted that water need not be laid on under a greater pressure than will make it reach an altitude of 35 feet above the ground level of any premises to be supplied; and the Corporation are not to be liable for any penalty for not supplying water if prevented by unusual drought, frost, or other unavoidable cause or accident, or during necessary repairs. The words "altitude of 35 feet" are to be substituted for "the top storey of the highest houses" in section 35 of the Water-Works Clauses Act of 1847, in its application to the water-works of the Corporation. As from Dec. 31 next, the charges for water for domestic use beyond the city are altered. Supplies by meter to private consumers are to be furnished on the same scale throughout the whole compulsory area, and water for public purposes is to be sold at a maximum price of 4d. per 1000 gallons. [*Parliamentary Agents: Messrs. Sherwood and Co.*]

A General Powers Act obtained by the Manchester Corporation confers upon them authority to carry out certain works, consisting mainly of extensions of existing weirs and watercourses, the construction of two more of the latter, and the diversion of two public roads. They may purchase by agreement additional lands not exceeding in the whole 50 acres; and they may borrow for the above-mentioned purposes £160,000, to be repaid within fifty years, or ten years less than the Corporation asked in their Bill. [*Parliamentary Agents: Messrs. Sharpe, Pritchard, and Co.*]

The Margate Corporation Act gives them authority to erect a pumping-station and lay down pipes for furnishing a supply of sea water on such terms and conditions as may be prescribed—all expenses in connection with the undertaking to be defrayed out of the district fund, into which all receipts are to be paid. The Act contains a provision giving the Corporation power, at their own cost, to require the situation of gas-pipes under the streets to be altered, but not to their permanent injury, or to the interference with the free and convenient flow of the gas. The

Bill contained clauses to enable the Corporation to lay water communication-pipes on behalf of owners or occupiers of premises, and to repair them if necessary; but these provisions do not appear in the Act. [*Parliamentary Agents: Messrs. Sharpe, Pritchard, and Co.*]

By the Padiham Urban District Council Act, the limits of supply are extended so as to include the township of Simonstone, in the county of Lancaster. In the Bill as introduced, the township of Sabden and part of Altham were included. The Council may purchase by agreement the mains, &c., of the Burnley Rural District Council used for supplying water in Simonstone. The charge for water for domestic purposes is to be on the gross estimated rental of the whole of the premises supplied; and the Council may supply water by meter on such terms as may be agreed upon, but at a price not to exceed 2s. per 1000 gallons. In the case of houses partly used for trade, the charge may be not less than 10s. per quarter; and in out-districts, they may be one-third higher than within the area. The powers granted to the Council's predecessors for the construction of certain works specified in an Act obtained in 1889 are extended for a period of ten years from the expiration of the period limited by an Act of 1896 for carrying them out. Authority is given to the Council to allow discounts or rebates, and to borrow the sum necessary (not exceeding £200) to purchase the mains supplying Simonstone.

The Rochdale Corporation have obtained authority to construct additional water-works, consisting of a covered service reservoir, two lines of pipes, and a communication road, to be completed within seven years. They have also been granted an extension by ten years from the 12th of August last of the time specified in their Water Act of 1898 for the completion of a storage reservoir then sanctioned. Persons taking water from any of the troughs of the Corporation for the use of locomotives, steam-engines, lorries, waggons, or other motor vehicles, except by agreement, are to be liable to a penalty not exceeding £5 for each offence. Authority is given to raise £18,000 for the purchase of lands and easements for the water-works and for the construction of the reservoir and the road, £5500 for the pipe-lines, and £10,000 for new mains, extensions, service-pipes, and meters—to be repaid within sixty, forty, and thirty years respectively. [*Parliamentary Agents: Messrs. Sherwood and Co.*]

The Act of the Skegness Urban District Council is (*inter alia*) to authorize them to purchase the undertaking of the Skegness Water-Works Company, and supply water within their district, the parish of Winthorpe, and part of the parish of Croft, all in the Parts of Lindsey, in the county of Lincoln. If within six months from the 4th of August last the Council give notice in writing of their intention to purchase, the Company are to sell their undertaking, subject to, and in accordance with, the provisions of section 70 of the Skegness Water Act, 1905. On payment of the purchase-money, the concern is to be wound up and the Company dissolved; but until the transfer they are to manage it, pay all outgoings, and be entitled to all receipts. The Council have authority to borrow the sum necessary for completing the purchase and defraying the incidental costs and expenses, and forty-five years are allowed them in which to repay it. [*Parliamentary Agents: Messrs. Tahourdins and Hitchcock.*]

The Stockport Corporation Act contains a section sanctioning the construction of a tramroad, about a mile-and-a-half in length, in the parish of Hayfield, in the county of Derby. It will commence at the boundary of the land belonging to the Great Central and Midland Railways Joint Committee at a point near the Hayfield Station, and terminate in the existing private road to the Kinder Water-Works of the Corporation. Authority is given to borrow £8600, repayable in twenty years, for carrying out the work, for the completion of which five years are granted. [*Parliamentary Agents: Messrs. Lewin, Gregory, and Anderson.*]

In the General Powers Act of the Wolverhampton Corporation there is a section setting forth that where a house supplied with water is let for any period less than a quarter of a year, the owner instead of the occupier shall, if the Corporation so determine, pay the water-rent, but it may be recovered from the occupier, and be deducted by him from the rent. In the Bill as introduced, there was a clause relieving the Corporation of the obligation to supply otherwise than by meter houses partly used for trade, but intimating their willingness to supply in such cases at a rate not exceeding 1s. 6d. per 1000 gallons. This, however, does not appear in the Act; nor does a proposal to incorporate section 17 of the Water-Works Clauses Act, 1863, by which a penalty not exceeding £5 is imposed for waste of water caused by supply-pipes, &c., being out of repair. [*Parliamentary Agents: Messrs. Sharpe, Pritchard, and Co.*]

Who is at the Bottom of This?

A firm of solicitors at Banbury sign a circular that has been sent round to gas and water shareholders. It is headed "North Oxfordshire Water Company, Limited: Extension of Water-Works near Banbury." There follows an invitation for applications for £2500 of 5 per cent. first mortgage debentures of £25 each, redeemable within seven years from the date of issue at a premium of 7½ per cent. This circular was received on Oct. 31; but "a full three months' interest will be paid to purchasers on 1st November next"—that is to say, on Sunday, the day after the circular was received! The old sprat to catch a mackerel. Though the circular is signed by a firm of solicitors in Banbury, the copy received was posted in London.

SCOTTISH JUNIOR GAS ASSOCIATION.

EASTERN DISTRICT.

Visit to the Stirling Gas-Works.

On Saturday afternoon, about thirty members of the Eastern District Section of the Scottish Junior Gas Association paid a visit to the works of the Stirling Gas Company. They were received by the Manager (Mr. J. D. Smith), by whom and the Assistant-Manager (Mr. D. Currie) they were shown round. Special attention was paid to the equipment of the retort-house, where is situated electrically driven machinery for elevating the coal and for charging and discharging the 20-feet retorts; the machinery being that of Messrs. Robert Dempster and Sons, Limited, of Elland. The installation was inaugurated in the autumn of last year, and was described in the "JOURNAL" for Sept. 24; and in its working since it has given the utmost satisfaction. The visitors saw the machinery in operation—the men handling it smartly and getting through their work cleanly and efficiently. Everitt's patent tar-extractor, also furnished by Messrs. Dempster, was then looked at; Mr. Smith (who, it may be remembered, described the apparatus at last year's meeting of the North British Association of Gas Managers) explaining its working. He showed at the entrance to the tar-well the naphthalene which it takes out of the gas, coating the sides and cover, and stated that during the twenty months in which the apparatus had been at work, he had had no trouble with naphthalene till a week ago, when three cases came under his notice. The extractor, which is situated after the condenser, is actuated by exhaust steam, and in the working the steam raises the temperature of the gas from 120° to 130° Fahr. In the yard, operations have been begun for the erection of coke-handling plant—the beginnings of a larger scheme which is in contemplation. The erection of this plant has also been let to Messrs. Dempster. For some time to come the quenched coke will be wheeled into a boot, whence it will be elevated by machinery so designed that the coke may be loaded into railway waggons upon the siding which runs into the retort-house, and beside the weighbridge; or it may be turned into hoppers from which carts can be loaded, or binged in the yard. The cost of the plant under construction is roughly £1000. In the governor-house was seen a Wright's recording pressure-gauge, which is wound up once a week, and contains a roll covering 60 days.

At the conclusion of the inspection, the visitors were entertained by the Company at tea in the Waverley Hotel.

Mr. SMITH expressed the pleasure it gave him to see the members. He said the Stirling Gas-Works were not very large; but the Company claimed for them that, so far as they could go, they were up-to-date. Their carbonizing results were proving very satisfactory, and quite equal to their anticipations. He did not wish to speak in a boastful way, but when he mentioned that they were getting 11,000 cubic feet of 20-candle gas per ton of coal, the members would see that the results were fairly good. He trusted their visit had been a satisfaction to them.

The PRESIDENT (Mr. A. Morton Fyffe, of Dundee) said he was certain the members had spent a very pleasant and profitable afternoon. They had enjoyed very much their visit to the works, and had appreciated the up-to-date methods and appliances used. They were all delighted with what they had seen; and he asked them to accord to Mr. Smith and his Assistant a hearty vote of thanks for their kindness, and to the Stirling Gas Company for their hospitality. They were all delighted to have two of their honorary members with them—showing that they took an interest in the affairs of the Association; and they would be very pleased to hear any remarks they might have to make.

Mr. A. WADDELL (Dunfermline) said he felt it a great advantage to young men to make such visits as the one just concluded. To live in a works all their lives, and know nothing of what was going on in other works, was calculated to make a man much less valuable than one who went round and saw the different ways of doing things, because he was able to form an opinion as to which was the best method. He (Mr. Waddell) hoped the young men of the Association would take the fullest advantage of such visits. It was evident that Mr. Smith had been a busy man since he went to Stirling. He had spent a large amount of money, but had spent it well.

Mr. J. W. NAPIER (Alloa) desired to associate himself with the remarks of Mr. Waddell regarding the profitable afternoon they had spent. His feeling always had been that the visits of the Junior Association, and the practical way in which they carried out their work, were a very serious reflection indeed on the Senior Association. It was true that the last two years had seen the beginning of their Commercial Sections; and so far as their work was concerned, they were certainly bringing gas managers into closer touch with the commercial affairs of their business. He did feel, however, that one meeting per annum of the premier Association was not sufficient, having regard to the huge interests of the gas business. Regarding the visit that afternoon, it was one of the striking features of gas-works management that medium-sized works had been introducing stoking machinery. This had only been possible by reason of the fact that machinery could now be procured at a reasonably low capital outlay, and also at a minimum cost for repairs and maintenance. The Arrol-Foulis type of machinery was only suitable for large establishments. In medium-sized works they did not find it profitable to introduce

such expensive plant. Now, when they had it electrically driven, they were in a position to introduce machinery in much smaller works. Mr. Smith had put in one kind of plant at Stirling; and he (Mr. Napier) had adopted another at Alloa. While not wishing to raise any point of difference which would have reference to their relative advantages, he should say that this type of plant had proved in every way an absolute success. He was hopeful that, as time went on, electricity in gas-works would be found to be of much more use. It was a great pleasure indeed to him, as an honorary member of the Association, to be present, and to observe the interest and the enthusiasm manifested by the members; but he sometimes thought that they, in Scotland, living so far north, were at a disadvantage. In the first place, the Press of their industry was situated in London; and he had always felt that if they had a Press of their own—as he did feel that they were of sufficient importance to have—perhaps a greater degree of attention would be paid to their affairs, so far as they were localized in Scotland, than was the case at present. He was not depreciating in any way what was being done so effectively and so well; but the members would agree with him that the Press, not only in the political, but also in the commercial and technical world, was a very strong and powerful factor indeed. Then with regard to the examinations in "Gas Manufacture," they took place in London; and while the City and Guilds of London gave to the young men of their profession the hall-mark of efficiency, he did think that in Scotland they ought to recognize that they were sufficiently important to have a centre of examination for themselves. He was not quite sure in what direction it would be best to move, but he did feel that if some of their more important technical colleges, in either Edinburgh or Glasgow, would take up the question, it would, as it were, bring the position of gas engineering into greater prominence in their own particular sphere.

MICHIGAN GAS ASSOCIATION.

[From an American Correspondent.]

The Seventeenth Annual Convention of the Michigan Gas Association was held at Kalamazoo from the 23rd to the 25th ult., and was well attended. Last year you were justified in publishing extracts from several of the papers read; and, speaking generally, I believe the Association to be one of the most useful in existence. The members fraternize in a way which could hardly be possible with other than Americans; and yet they are just as keen and alive to reciprocity in their intercourse on gas questions as are the more matter-of-fact members who gather at the meetings of the American Gas Institute. It really does one good, outside of business interests, to associate with men of this class, who are as free and open-hearted with a foreigner and comparative stranger as with born Americans and personal friends of many years' standing.

Mr. Alonzo P. Ewing, the genial Secretary, is typical of this Association and of American business methods. In appearance, he seems to be too youthful to carry the great responsibilities attached to his situation of Purchasing Agent and New Business Manager of the Detroit City Gas Company. But his record speaks, even if no note is taken of the masterly way in which he conducts the business of the Association. To those who do not know Detroit, I may say that the population is some 400,000, and coal and oil gas are made to the extent of about 2215 millions per annum to supply 90,000 meters through 470 miles of mains. The price is fixed by a monthly increment rate; the maximum being 90 c. (3s. 9d.) and the minimum 60 c. (2s. 6d.) gross, which is lower than usual out here.

The Association includes six honorary members; the foremost among them being Mr. E. C. Brown and Mr. E. P. Callender, the Editors respectively of "Progressive Age" and the "American Gaslight Journal," who are thus, in a small way, perhaps, recognized for the excellent help they give to the American gas industry. In like manner a compliment is paid and deserved recognition given to Mr. Campbell and Professor A. H. White, who are appointed by the Association as representatives of the gas industry in the University of Michigan. Last year the paper submitted by Professor White, in conjunction with Mr. F. E. Park—showing the results of the tests made by them on the experimental plant built specially for the Association's needs at Ann Arbor Gas-Works, Michigan—was given in the "JOURNAL" for Oct. 8, p. 101. This year Professor White, collaborating with Mr. Park and Mr. W. A. Dunkley, contributed further to the knowledge of the members.*

PRESIDENT'S ADDRESS AND PAPERS READ.

The President (Mr. D. H. Frazer), at the commencement of his address, paid a high tribute to the city of Kalamazoo, which you may know as the birthplace and present home of the Humphrey arc lamp. It does also a very good business in other gas appliances. It is usual that the President should occupy the chair in his place of business. But last year Kalamazoo had no suitable hotels; and as Mr. Frazer, of Battle Creek, was elected President, the meeting could not be held again there this year. Mr. Frazer was no doubt correct in looking upon last year's business depression as good in some ways. Just previous to the great drop in confidence there was far too much of it; and any old "wild cat" scheme was sure to get a backing. The depression had to come as a natural reaction; and it meant a regular setting in order of establishments which were being worked at breakneck pace and in a slovenly manner. Now that business is getting better gradually, but yet very surely, the trade of the world will in all probability be on a sounder foundation, and not be likely to get a similar jar in a generation. There has been no set-up in gas consumption; but there has been a much-needed decrease in reckless extravagance in construction. Mr. Frazer counselled energetic measures in new fields, and expressed the belief that a progressive policy in trying to introduce gas for mechanical and industrial uses will meet with as great results as those obtained by the new commercial and new business departments.

With regard to competition, the President said that in commercial lighting it had been very keen, due largely to the more general introduction of high efficiency metallic filament electric lamps, and in some places to gasolene plants. Referring to the paper read before the Wales and Monmouthshire Institution of Gas Engineers—in which Mr. J. H. Canning stated, in comparing gas at 3s. per 1000 with electricity at 3½d. per unit, and including renewals, that "for equal amounts of light, incandescent gas is only one-third the cost of the most efficient of the metallic filament lamps"—he said reports of tests in America also led one to believe that the introduction of the improved electric lamps would not seriously affect gas. Their gas-burner manufacturing friends were not asleep, and the present outlook was that gas suppliers would be in a stronger position than ever to meet competition this autumn. Now that "push-button" gas lighting was working successfully, there was need of a satisfactory porch lamp to operate by a push-button, not so much for the consumption by the light itself, as for the business obtainable by having such a light. In a great many cities, the majority of houses are either piped or wired, but not both; and frequently electricity is chosen on account of the porch lighting, where otherwise gas would be preferred.

Mr. Frazer's remarks upon the attitude a gas company ought to assume towards the public are well worth noting. In the States, the Press will get or make news; and any trust, large or small, is a good target to shoot at when the marksman poses as the defender of "the people." The President said gas suppliers should adopt a policy of publicity of their affairs. The majority of people believed in fair play, and the feeling against gas companies was due largely to misapprehension of the facts. Many companies were "talking" to the public through the Press by publishing facts and conditions—not ordinary advertising.

In the United States, the commercial man is considered of perhaps more importance than the manufacturing staff; and it is not unusual for a company making gas in a poor way, and sending it out unsatisfactorily, to get splendid results purely on the qualities of its new business department or its salesmanship The nature of this department is partly explained in the paper read by Mr. Clark R. Graves (see p. 351). If the paper is conned in the spirit in which it was written—that is, with a determination to sell gas and gas-consuming appliances—it will be of immense benefit to a number of companies who were once content to hope that gas would sell itself. If a happy medium could be struck between the American selling methods and English manufacturing methods, we should surely arrive at a pitch of perfection seldom, if ever, attained in any trade. Is there a gas manager in the old country who looks forward to visits of salesmen and "solicitors"—*i.e.*, commercial travellers? Out in the West, we welcome such men, and perhaps it is this very welcome hand and smile which raises the responsive feeling in the breast of the "drummer" to elevate him from a "beast of burden," as he is in England, into a self-respecting, instructive, and intelligent citizen.

A paper differing widely from the one just noticed was contributed by Professor White and Messrs. Park and Dunkley (already referred to), which was on the "Destructive Distillation of Coal at Low Temperatures." After commenting on the variations in temperature found at different points of the charge of coal at certain periods of operation, Professor White suggests that a knowledge of the products of these primary reactions at low temperature should aid gas manufacture. It is pointed out that the much-discussed "coalite" is a bituminous coal changed by slow heating to a maximum temperature of 800° Fahr.; and the interest aroused by it may cause these experiments to be followed with more interest than they otherwise would be. After explaining the method of making the low-temperature distillations, and pointing out the considerable difficulty caused in examining the gases on account of the simultaneous presence of hydrogen, methane, and ethane, it is shown how the satisfactory results were finally obtained by using Campbell's method for the removal of hydrogen by a hot solution of palladium chloride, followed by Dennis and Hopkins's method for the combustion of the hydrocarbons. The rest of the paper is most instructive, showing as it does results which had been very carefully arrived at.

Three other papers—two on the subject of "Distribution"—were read at the meeting, but have not yet been printed. The third dealt with "Advertising of a Public Service Corporation," or, as it is termed in England, a "monopoly company." It was read by Mr. E. St. Elmo Lewis, the Advertising Manager for an adding-machine company. A considerable portion of the communication has but little bearing on the English side of the question; but as there are in it some good points which are applicable, and are presented in a readable manner, I have made extracts, and send them herewith. [They will appear later on.]

* The paper referred to will be found on p. 348.—ED. J.G.L.

ROUND THE WORLD—AND SOME GAS-WORKS.

By Maurice Graham.

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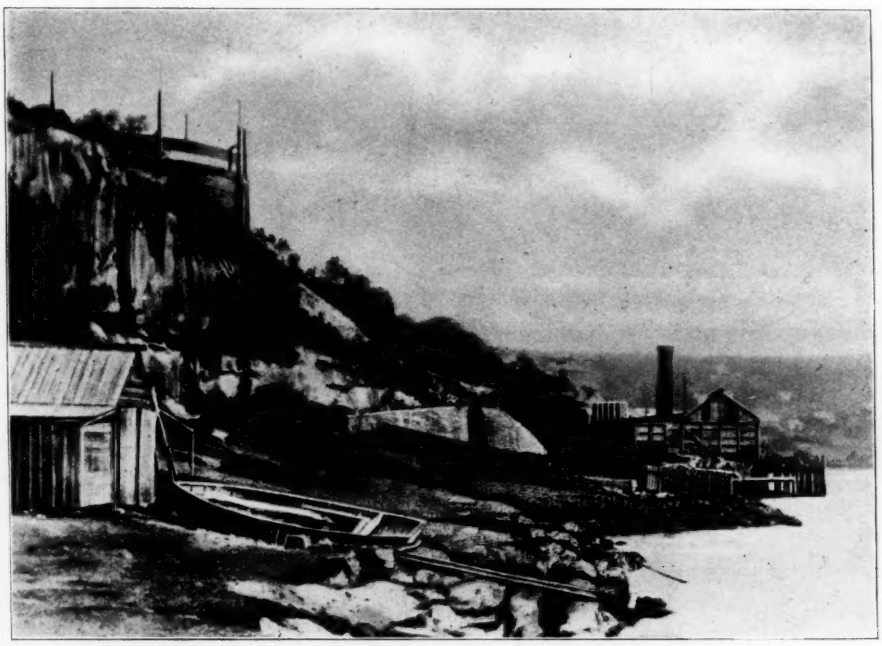


Photograph No. 114.—The North Sydney Gas-Works in 1882.

XIII.—FROM SYDNEY TO HONG-KONG.

After a trip to the famous Blue Mountains, and a visit to the wonderful Jenolan Caves—which were once a lake before being drained off by deeper subterranean rivers, and are now large chambers, some 100 feet diameter by 60 feet high, covered with stalactites and stalagmites—the writer returned to Sydney.

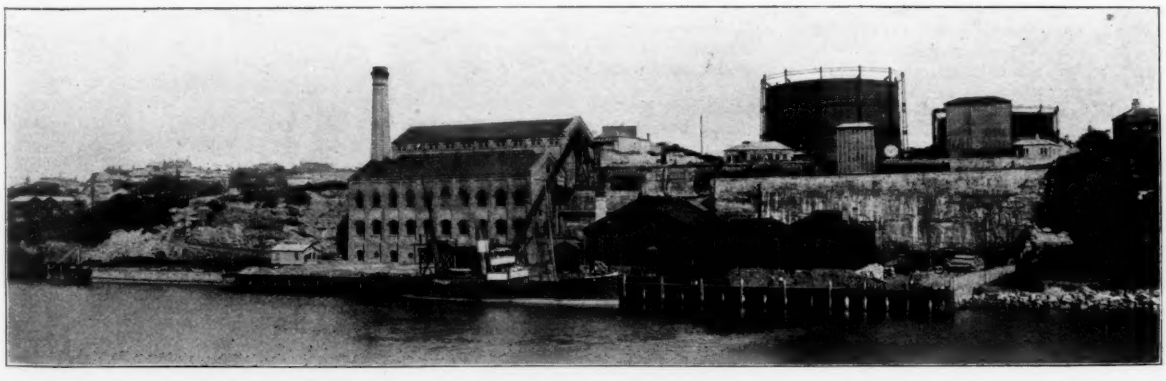
NORTH SHORE GAS COMPANY'S WORKS—NORTH SYDNEY.

A visit was paid to the works of the North Shore Gas Company, which are situated in North Sydney, and the Engineer and Manager of which is Mr. T. O. Morland, and the Secretary Mr. Edward Aiken. A steamer was taken at the Circular Quay; and after landing at Neutral Bay, a walk up the road brought the writer to the entrance gate, which led down a road (which can be seen on the left of a subsequent photograph, No. 115) cut out of the solid rock to a depth of about 30 feet. This road, Mr. Morland explained, cost about £1500 to make; but it has saved thousands of pounds, because, as the greater part of the gas-works (including the retort-houses) are built on a level with the sea, formerly the whole of the coke had to be hoisted to a height of 100 feet to the roadway above, whereas now (by the road) this is obviated.

The works proved to be most interesting ones to go round. Photograph No. 114 shows the original works as they were in 1882, and when Mr. Morland first arrived on the scene. Now compare this with Photograph No. 115, which shows the works as they are to-day. Readers will agree that the Engineer who has brought these works from the condition of 1882 to that of 1908 deserves every credit for his persevering and successful labours. It will be seen what class of excavation had to be done among the rock and to cut out the terraces on which the gas-works stand. The writer asked if these excavations or cuttings were not costly, and received the answer that the stone and debris were used for building and backing-up purposes. So that, although it may appear costly to the casual visitor, yet it was preferable to have the works where deep water at the quay or jetty could be retained. The information was also forthcoming that the capital expenditure of the Company per ton of coal carbonized was the lowest in Australia.

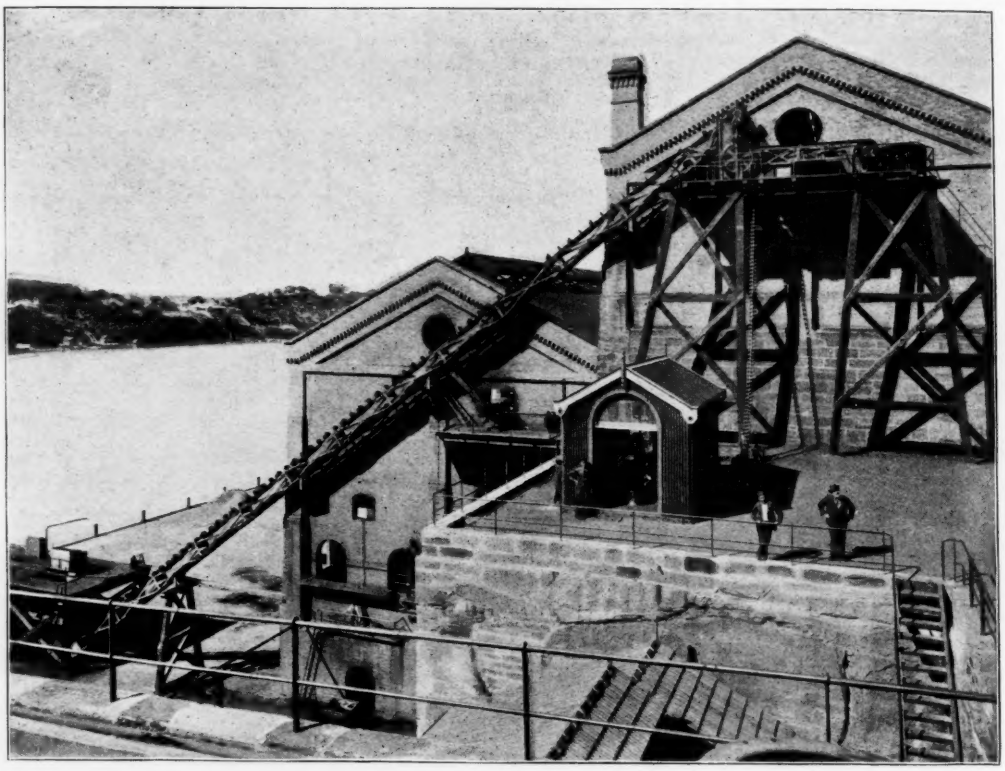
The North Shore Gas-Works were established in 1877, to supply gas to the suburbs lying to the north of Sydney Harbour —now known as the municipalities of North Sydney, Mosman, Willoughby, and Lane Cove. The population is about 56,000, and is rapidly increasing; so that the Gas Company, who are now the fourth in size in this part of the Southern Hemisphere, will shortly take third place and rival, at an early date, the Australian Gaslight Company's works for size and output. The area of the district is about 21 square miles. There is a new site of 11 acres available for future works' extensions.

The undertaking was purchased from the original proprietors by the present Company in 1883, when the annual output of gas was about 18 million cubic feet. It is now over 300 millions. The works are situated on one of the many picturesque indentations of Port Jackson. The rocky site of seven acres must have presented (as has been said) many difficulties to the designers—sloping sharply, as it does, from the water's edge to 80 feet or more above. But by reclamation and terracing it has been made suitable for gas plant, and a deep cutting (as before referred to)



Photograph No. 115.—The North Sydney Gas-Works in 1908.—The Cliff Road Entrance is on the Left.

[The building with the high chimney is the inclined retort-house; the building above it is the coal-store; the three smaller buildings on the quay-level are two retort-houses with a coal-store in between.]



Photograph No. 116.—The Landing Stage and Tramway, the Inclined Coal-Conveyor to the Coal-Store [the upper building **the Inclined Retort-House** [the lower building], **and the Gas-Engine Shed.**

through the cliff, gives good vehicular access to the wharf and coke yard.

Reverting to Photograph No. 115, it will be seen that a steamer is at the quay unloading her cargo of coal, which comes from the Maitland district. The coal is then elevated to the coal-store on the top terrace. The building adjoining the store, but on the terrace below, is No. 3 Retort-House, which contains ten beds each of seven inclined retorts, 20 feet long by 24 inches by 15 inches, tapering to 20 inches by 15 inches. They are heated by regenerative furnaces. The design of the coal-store and of this inclined retort-house has some unusual features. On the first terrace, about 48 feet above the retort-house floor, are ten tunnels; and above these the coal-store is built. Near one end of the retort-house, an overhead landing stage and tramway have been erected. The coal for the inclines is landed here; and, after being weighed and broken, it falls into an inclined push-plate conveyor, which delivers it at a height of 96 feet on to band-conveyors running the full length of the coal-store. These details are better seen in Photograph No. 116. The floor of the store is formed into twenty hoppers, each with a shoot at the bottom. These shoots project into the tunnels before mentioned; and through them the coal is loaded into tip-trucks running on rails laid with a slight fall towards the hoppers over the retorts.

In addition to being easily emptied, there are other advantages associated with a store of this class. The coal can be taken out in the order in which it is delivered, and can also be drawn at any time from any part of the store. Thus the stock need never become old or deteriorated. If liable to spontaneous heating, the temperature of the bulk can be quickly ascertained; and if higher than desirable, the heated contents can be removed.

On the tops of the inclined retort hoppers is another push-plate conveyor; so that when coal is being received from a steamer, a shoot (as seen in the last photograph) in the inclined conveyor trough can be opened, and coal in this way passed direct from the ship to the retorts.

Retort-Houses Nos. 1 and 2 are on the lower stage. No. 1 contains eight settings each of six horizontal retorts, 20 feet by 22 inches by 14 inches, heated from generator furnaces. Until recently these retorts were charged by shovel; but the bench is now being rebuilt, and a coal bunker, elevator, and De Brouwer "Complete Stoker" will form part of the new equipment. In No. 2 house, there is the same number of settings, with similar retorts, charged by shovel.

The coal for these two retort-houses is stored in the building in between them, and is cheaply removed from the ships by trucks running on an overhead tramway.

The coke discharged from the inclined retorts falls into tip-trucks which take it either to the breaker and coke-bin or to the stack. An illustration of this part of the works is given in Photograph No. 117.

Mechanical exhausters are now used, though until about four years ago the exhausting was done by steam-jet. The exhausters are placed before the condenser. The latter consists of four rows of 12-inch cast-iron pipes, two tiers high, fixed on end. By means of a four-way valve, the current of gas is reversed twice weekly; and since the introduction of this practice, naphthalene, which formerly was very troublesome, has gradually disappeared both from the works' mains and plant and from the consumers' services.

There are two sets of purifiers; four boxes being 16 feet square and four 25 feet by 30 feet. One set is water-sealed and the other dry. Locally obtained oxide of iron is the purifying material used. The purifiers, gasholders, and general office are on the top terrace of all.

The gas is measured by two meters of a capacity respectively of 20,000 cubic feet and 40,000 cubic feet per hour.

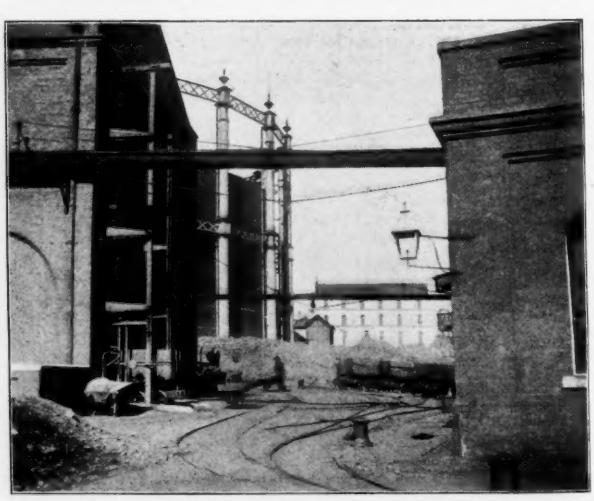
Of the two gasholders, one is a two-lift and the other a three-lift. Their combined capacity is 870,000 cubic feet of gas, though the greatest daily make of the works is 1,100,000 cubic feet.

A governor by Braddock, with self-loading apparatus, completes the plant, all of which (with the buildings) was erected by the Company's own workmen.

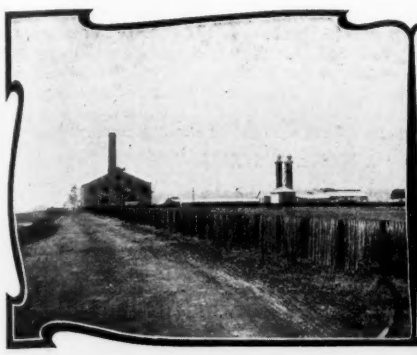
There is no bye-products plant, as the ammoniacal liquor is sold to be converted into anhydrous ammonia. The tar is used chiefly for road-making purposes.

The gas outlet main to the town is 24 inches in diameter, and the mains are laid at an average depth of 2 ft. 6 in.; whereas in Sydney they are 2 feet deep from the surface of the road to the top of the pipe.

The illuminating power of the gas is 16 candles; and its price



Photograph No. 117.—Ground Floor of the Works, where Coke Operations are carried on.



Photograph No. 118.—The Approach to Newstead (Brisbane) Gas-Works.

Photograph No. 119.—Mr. J. H. Tomlinson, Chief Engineer of the Brisbane Gas Company.

Photograph No. 120.—The Foreman and his House on the Works.

is 4s. per 1000 cubic feet. The public lamps are fitted with incandescent burners; and gas is largely used for cooking and for motive power. The consumption increases at the rate of from 10 to 18 per cent.; and, in fact, it has trebled in eight years. A great future for the Company may, therefore, be anticipated with every confidence.

Extensions are always going on; and in the carbonizing department it is probable that the vertical system will be adopted, as labour troubles are so great. Besides this, the formation of the land and site lends itself admirably to the adoption of verticals.

The writer wishes to express his thanks to Mr. Morland for his kindness in taking him round the interesting works, and also his indebtedness for the information embodied in this article.

IN QUEENSLAND.

From Sydney, the writer travelled on to the fifth and last state of Australia, Queensland. This beautiful semi-tropical state, covering an area of 700,000 square miles and having only a population of 700,000 people including the aborigines, may be considered the youngest of the five states. The climate inland in the summer season is a dry heat, whereas on the coastal belt the rainy season brings with it a humid atmosphere, which is very objectionable to Europeans, although not more so than in Ceylon and Burmah. Close to the seashore, however, the winds make the climate perfectly delightful; the winter months from May to August being quite balmy.

Every inducement is given to the emigrant and "new chum" to centre his thoughts upon this state, which abounds in rich soil suitable for growing grain, sugar cane, and for the grazing of cattle. Land is cheap and easily obtainable; and when once cleared profitable results quickly follow. In the northern part of Queensland, there are thousand of acres lying idle, waiting for the Englishman or Colonial who is willing to invest a small capital of (say) £200 or £300, and at the same time is prepared for hard work. For any men with grit, determination, and perseverance, there are large fortunes awaiting them.

The railway track in Queensland is built on the narrow-gauge (3 ft. 6 in.) system, and unfortunately is not of the same gauge as that of the adjoining state. However, as the population and revenue are so small, the lowest possible outlay was decided upon.

Brisbane and Its Gas-Works.

When the writer visited the capital, Brisbane, which has a population of 60,000 people, he was greatly struck with its Colonial appearance, which is more noticeable than in any other town visited in Australasia.

The city is straggling; and its wooden bungalows are in no way crowded together. Each is enclosed in its own ground or paddock. The roads are roughly made, and merely macadamized in the centre; leaving the grass to grow at the sides and on the footpaths. The ugly rough-hewn telegraph posts are put up anywhere and everywhere, and disfigure the city and spoil the best buildings.

Brisbane is entirely dependent for its prosperity upon what is known as its "back country," as its exports are entirely agricultural.

After seeing the various sights, the writer made his usual call at the gas-works, which belong to the Brisbane Gas Company. The first works were established in the year 1864, and were situated on the river bank at Petrie Bight, near the centre of the city. A small retort-house, pipe condensers, and other apparatus, and a 45,000 cubic feet gasholder, were put up. As the consumption increased, second and third gasholders were erected; bringing the storage up to 595,000 cubic feet. About 1885, it became necessary to look out for a new site for works. The suburb of Newstead was chosen; and about 20 acres of land were acquired. Any apparatus worth removing from the old site was moved; and one of the holders was re-erected as a station holder in another district.

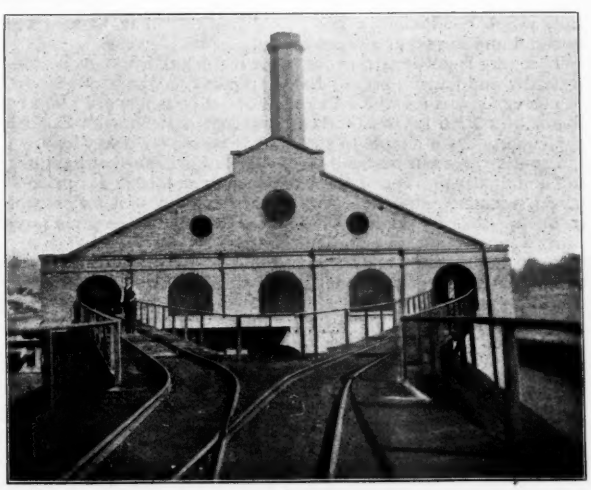
The approach to the gas-works at Newstead is seen in Photograph No. 118. Here the writer had the pleasure of shaking hands with Mr. J. H. Tomlinson, the Chief Engineer, who is well known among the gas fraternity as the John Bull of Australia—and right well he deserves the title, for a more genial and pleasant man one could not wish to meet. He is the picture of health and happiness—and was snapshotted in Photograph No. 119. He entered the service of the Gas Company as Chief Engineer in 1879—being the successful candidate out of 88 applicants, who were nearly all Englishmen; so there must have been a rush for the Colonies in those days. At that time, he held an appointment under Mr. Corbet Woodall, who was then Resident Engineer at the Phœnix Gas-Works, London.

Mr. J. G. Vidgen, who has only just retired from the position of Secretary of the Company, held his appointment for 35 years. About twelve months ago, Mr. John Gasteen, whose connection with the Company has been a long and honourable one, was appointed Secretary in place of Mr. Vidgen.

Mr. W. T. Nye, the Assistant-Engineer, was for many years Manager of the Rockhampton Gas Company, Queensland.

The late general foreman of the Brisbane works has just retired after a service of 40 years; and Mr. James Johnson fills the vacancy after a service of 27 years. A photograph of him and his house on the works is given in No. 120.

As a good example of long service in a small Gas Company, it may further be added that the present Chairman, the Hon. James Cowlishaw, Member of the Legislative Council, and the Deputy-Chairman, Mr. L. A. Bernays, C.M.G., were both members of the original Committee, appointed by the inhabitants in 1864 for the purpose of forming a Gas Company. These two gentlemen have, therefore, both seen 44 years' service, and still continue in office.



Photograph No. 121.—A View of the Retort-House and Coal Gantry over a River.

That the efforts of the Directors and their staff through long years have proved successful is shown, among other things, by the excellent balance-sheet of the Company for the last half year. There was a net amount to the credit of the profit and loss account of £13,732, out of which a dividend of 5½ per cent. was paid and a balance of £4492 carried forward. A healthy financial state of affairs is indicated by the considerable amounts written off for reserves and renewals of holders, retort-beds, and meters. What a contrast this is to some electric light companies!

Turning now to the Newstead works, the writer can say that no money has been wasted on elaborate ornamentation of buildings. Mr. Tomlinson rightly bore in mind the high price of labour—bricklayers getting 12s. to 15s. per day of eight hours, and other workmen being paid at similar rates. The retort-house is built of red brick, but is not of expensive design; and other buildings are either of corrugated iron or wood, so arranged that the sides or ends can be readily removed in hot weather.

The coal seen by the writer was a rather dirty, small slack,

with an odd lump now and again. It comes from the Ipswich (Queensland) district, and gives 11,000 cubic feet of gas per ton, with a good coke, which commands a very good local market. There is an overhead gantry running from the river to the retort-house; and at the end of this structure is a steam-crane, which hoists the coal from the boat and deposits it in the trucks, running direct into the retort-house. (See Photograph No. 121.) There is also an overhead railway for feeding the coal-stores direct from the ground-line; so that an ample supply can be maintained. A coal-store is on each side of the retort-bench.

The carbonizing plant consists of ten beds of horizontal through retorts, arranged in seven's, 20 feet long by 21 inches by 15 inches, heated by regenerative furnaces; also another bench of ten beds each of seven retorts about 20 inches by 14 inches with circular lids; the furnaces being direct fired. These latter, however, are now being pulled down, and a new bench will be erected similar to the regenerative bench. There is also under consideration the adoption of stoking machinery, directly the second bench is completed. Possibly, also, hot-coke conveyors may be installed. The house can be described as a stage-floor building, with plenty of room for any class of machinery.

The hydraulic mains are about to be raised and supported on cross joists, so as to give a better level and keep them away from the heat of the bench. At the same time, it is the intention to erect tar-towers for regulating the seal and obtaining a better flush and greater freedom from pitch.

The condensers consist of two batteries of Cutler's tubular design, covered over to protect them from December heat. The exhauster house contains three of Gwynne's rotary exhausters. There are also two tower scrubbers by Dempster's. Next comes a "Standard" rotary washer. The purifiers are four in number, each 20 feet square, with water-sealed covers and a hydraulic jib-crane for each pair. Oxide is the only material used in purification.

The meter-house contains a well-decorated Braddock meter; and the governor gives a good constant pressure on the town of 3 inches, which is satisfactory for the incandescent burners.

The telescopic gasholders are 160 feet diameter by 60 feet and 120 feet diameter by 44 feet. Their total capacity is 1,650,000 cubic feet, or over one-and-a-half times the maximum daily make, which is about 1,000,000 cubic feet. The annual output of the works is 185 millions.

The writer noticed a carburettor, which Mr. Tomlinson has used for some time. Gazine is the enricher and solvent employed in it; and it has been found most successful in clearing the mains of naphthalene deposits. He lets a small quantity drip upon the affected part, and finds instant relief. Mr. Tomlinson was asked his opinion of the use of gazine; and his answer was a most emphatic reply in its favour.

A sulphate plant was working and producing a well-coloured salt, which commands a good local market. Tar is in great demand and is sold at 2d. per gallon.

There are small repairing shops for meters and fittings, besides a smithy and joiner's shop. Larger repairs are done in the town.

The gas-mains (of which there are about 90 miles) are laid at a depth of 2 ft. 6 in., as the roads are not made on the English principle, and are unable to stand any excessively heavy load.

The incandescent burner is responsible for the street lighting; the illuminating power of the gas being 17 candles. Its price is 6s. 8d. per 1000 cubic feet, with 25 per cent. discount for prompt payment—that is, 5s. net, or exactly one-third of the price forty years ago.

As an interesting illustration of the land boom about six years ago, it may be mentioned that the Gas Company sold their office site to a purchaser for £100,000, upon which he paid a deposit of £25,000. Failing to complete, the deposit money was forfeited, and the site was eventually sold to the Brisbane City Council for £30,000. This transaction necessitated the purchase of another site for the Company's offices; and a very handsome building has been erected at a cost of £6000. Here are found the board-room, secretarial and engineering offices, and a fine cashier's counter in the main hall, which gives a palatial air to the whole building.

Views on Pushing Gas Sales.

The writer was given to understand that the general sale of gas stoves, cookers, and fittings was going to be more energetically pushed by the Secretary, who has a scheme in hand similar to those adopted in the Old Country and already carried out at many of the works visited by the writer. The greatest attention should be given to this branch of the business, as it merely corresponds to the sales department of a large manufacturing concern. Where is the manufacturer who is satisfied with his style of manufacture only? Neither should a gas engineer be satisfied only with his carbonizing plant or gas apparatus. The antiquated idea of waiting for an increase of population, and an anticipated increase of consumers in consequence, will not do nowadays. Gas companies should forget all about the monopoly they have, and should use a little persuasive coercion (if the phrase may be allowed), so as to drag the consumer out of his old ways by enticing him to adopt new methods of gas consumption, on the condition that the gas company will put in the new apparatus free of charge for the first quarter, so as to prove its efficiency and economy.

In concluding this account of a visit to Brisbane, the writer would like to add that the shares of the Brisbane Gas Company constitute a sound investment; and investors have not been slow to realize this fact. For though Brisbane is at present lying dormant—with a 7 per cent. increase in the gas consumption—it has a great future predicted for it by the leading land experts, who understand the value of the back-country which extends for miles adjacent to the town. The list of shareholders contains many names of persons residing in the Old Country, all of whom may rest assured of the future success of their undertaking.

"A White Australia."

Intimately connected with the prosperity of Queensland and its capital, Brisbane, and indeed with the whole of the Commonwealth of Australia, is the policy that is summed up in the phrase "A White Australia"—that is, excluding by law the black or yellow races and the preservation of Australia as the country of the white man. In consequence of this disastrous policy, squatters, settlers, mine owners, and all large employers of labour have been heavily burdened. Had there been an excess of immigration by white men so that it was a difficult matter for them to obtain employment, one could readily understand this stringent law. But such is not, and never has been, the case. Australia has not been favoured for some time past by the emigrant; and therefore the present occupants of cattle and sheep stations and mines have had in many cases to shut down. The new law has put a premium on the black and Chinaman who, being already in the country, were allowed to remain. Sooner or later the Commonwealth will see the folly of their exclusive policy, and realize that they are not actually benefiting the artisan class in the towns at all. "A White Australia" suits only the working man of the towns; and it is merely a politician's cry for votes. Such is the impression of the writer, who hopes that, when it does become absolutely essential to provide coloured labour, it will not then be too late; or, in other words, after thousands have suffered from perpetual losses due to not being able or allowed to work their holdings.

En Route.

The s.s. *Empire* left the Pinkenba Quay, Brisbane, and called at Townsville, Cairns (the only town with gas-works), and Cooktown—called after Captain Cook, who navigated the waters of this north-eastern corner of Australia. Thursday Island, in the Torres Straits, was the next port of call. Then, after crossing the Gulf of Carpentaria, Port Darwin was reached. This town is the cable station, and was a thriving district; but its trade is now dead—killed by the prohibition of black labour referred to above. This is the last glimpse of Australia; and the writer looks back with pleasure on the many weeks he has spent in its five states, which have provided new and varied food for reflection.

Manilla.

After seven more days at sea, and after passing several active volcanoes and many interesting groups of islands, the steamer arrived at Manilla (Philippine Islands). The harbour and town have been greatly extended and improved since the American possession. The town has been transformed from a sleepy Spanish town to a city of hurry and bustle, with electric cars and electric light. The writer asked an American: "Have you gas?" "No," said the American, "we have not found gas yet." The only gas he knew of was natural gas. There are, in fact, no gas-works in Manilla. It is not within the scope of this article to describe this beautiful Eastern City, with its lovely parks, promenades, and grassy lawns, surrounding the Old World buildings. The Americans have remodelled everything, and will no doubt reap the benefit directly they can get settlers on the land. At present, the revenue falls short of the expenditure by £20,000 per annum.

Another two days' sail, and Hong-Kong was sighted.

The St. Petersburg Gas Contract.

The "Financial News" learns that Coalite Limited have received telegraphic advice from their St. Petersburg representative that the decision of the Municipality with regard to the future carrying on of the gas-works of the city has had to be postponed until March 15/28 next. Our contemporary understands that the main, if not the only, reason for this decision is that the Executive Committee of the Council were unable to get their report in the hands of the Municipal Duma in sufficient time to allow of their recommendations being given effect to prior to the date upon which the Gas Company terminated their contract of fifty years' standing—viz., Oct. 10/23. The result is that the Municipality have temporarily assumed possession of the gas-works, which the Council therefore decided to carry on themselves during the winter months, as building operations in any case will not then be possible.

At last Wednesday's meeting of the Evening Star Lodge, a presentation, consisting of a silver tray, was made to W. Bro. Thomas H. Martin, in recognition of his eminent services to the Lodge for ten years up to the end of 1907. The salver bore a suitable inscription, testifying to the esteem and regard of the members of the Lodge for their late Treasurer. At the same meeting, the selection of W. Bro. T. H. Priestman for "London Rank" was signalized by the presentation to him of the Regalia authorized by the Grand Lodge to be worn by those appointed to the position.

NATURE OF VOLATILE MATTER OF COAL AS EVOLVED UNDER DIFFERENT CONDITIONS.

By HORACE C. PORTER and F. K. OVITZ.

There was reprinted, by permission of the Chief of the Staff of the United States Geological Survey, in the "American Gaslight Journal" of the 14th inst., an account of some experiments on this subject which constituted a part of the fuel investigations conducted during the years 1907-8 by the Technologic Branch, U. S. Geological Survey, and which investigation is still being carried on under the same and like lines.

It is a familiar fact to retort coke-oven and gas-works operators that the volatile products of coal are largely affected, both in quantity and character, by the conditions of temperature and the rapidity of the rise of temperature in the coal, and by the conditions to which the products are subjected after leaving the coal. The laboratory determination of volatile matter serves almost universally as a more or less valuable indication of the coal's adaptability to industrial uses either for combustion, destructive distillation, or gasification. The method for this determination is, however, an arbitrary one, and does not duplicate closely that of any industrial operation; nor is the character of the volatile matter produced by the laboratory method known with any degree of certainty. Furthermore, the results by the laboratory method are very sensitive to varying conditions; and the influence of such variation on the character of the volatile products has not heretofore been the subject of extended study.

The importance of the *rôle* played by the volatile matter in all industrial applications of fuel is generally recognized. There are more heat units in the volatile matter in proportion to its weight than in the fixed residue. Pittsburg coal of 30 per cent. volatile matter and 7 per cent. ash has 36 per cent. of its heat in its volatile matter, as shown by comparing the heat values of coal and coke. When coal is fired under a boiler, either by hand or mechanically, it first undergoes a process of distillation; and both the quantity and quality of the volatile products and the relative ease of their liberation are concerned very largely in the boiler efficiency and the production of smoke. It is reasonable to suppose that coals of different origin yield volatile gases carrying different percentages of tarry vapours and heavy hydrocarbons, and may on this account differ in smoke-producing tendencies. A knowledge of the chemical reasons why coals smoke in varying degree, and why high volatile coals are hard to burn with maximum efficiency, is a necessary preliminary to the taking of intelligent steps toward improvement in these respects.

The gas-producer for bituminous and low-grade fuels is coming more and more into favour. Here also the volatile matter in the fuel plays a very important *rôle*, since at the top of the fuel-bed a process of distillation is continually going on. A certain proposed new type of producer will utilize high volatile fuels—such as bituminous coal, lignite, peat, and wood—by passing the hot gases from the producer through the raw fuel in a series of preliminary chambers, thus distilling the valuable hydrocarbon gases (and ammonia) out of the fuel before it is charged into the producer.

Attention need hardly be called to the pre-eminent importance of the volatile matter of coal in the illuminating gas and bye-product coke-oven industries. It is of interest, however, to note the increasing favour accorded by the gas industry to the vertical gas-retort as most successfully operated by the Bueb system at Dessau, Germany, and to explain that one advantage of this process lies in avoiding the decomposition of certain valuable gases in passing over heated surfaces, as occurs in the ordinary processes, although at the same time a greater gas yield is obtained by using higher temperatures in the retort itself.

In connection with the bye-product coke-oven industry there have been many experiments carried out on the industrial scale to determine the yield and quality of bye-products from coal, and the composition of the gas at successive stages, and many also of similar nature in connection with illuminating gas manufacture. In very few of these experiments, however, has there been any comparison of the behaviour of different types of coal under the same conditions or any study of the effect of varying conditions on the volatile products.

The purpose of the investigation described in this paper has been (1) to throw light on the nature of the volatile products from coal, and on the manner in which they are affected by the conditions prevailing during their formation or to which they are subjected after formation; (2) to contribute, in the interests of smoke abatement, some data on the comparative amount and character of the gases and vapours distilled from different coals at low temperatures—a subject intimately concerned in the production of smoke; (3) to prove experimentally that the volatile product of coal is to some extent incombustible, and that the proportion of inert volatile matter varies in different coals; and, finally (4), to show that the oxygen of coal is in many cases evolved in the volatile matter very largely in combination with carbon as carbon monoxide and carbon dioxide as well as with hydrogen as water, thereby explaining in great degree the discrepancy found in these cases between the determined calorific value and that calculated by Dulong's formula.

Volatile Matter at Ordinary Temperature.

Parr and Wheeler have noted the accumulation after ten months of combustible gas in tightly sealed glass jars containing samples of Illinois coal. They do not, however, report any determinations of the quantity or composition of these gases. Other investigators have extracted and analyzed gas from coal under reduced pressure at ordinary temperature. But a study of the formation of gas and absorption of oxygen by coal during storage for a long period does not seem to have heretofore been attempted.

In connection with a series of experiments (not yet completed) on the deterioration in heat value of various coals during storage under different conditions, we have found in certain cases a liberation of gas in remarkably large quantities. About 25 lbs. of coal of buckwheat size was stored in a 20-litre glass bottle closed with a rubber stopper, which was provided with glass tubes for removing gas samples. The bottles stood in the laboratory at a temperature ranging from 20° to 25°. In some of the bottles the coal was immersed in distilled water and the interstices well filled with water by attaching a partial vacuum for about an hour. About 400 c.c. of air remained above the surface of the water. Some of the results on the examination of the gas are given below.

TABLE I.—*Composition of the Gas Taken at the Surface of the Coal if not Immersed (no Tests of Illuminating Power).*

Time in Storage.	CO_2.	O_2.	CO.	CH_4.[3]	H_2.	N_2.
Coal No. 23.[1]	Immersed under Water.					
4 days. . .	0·3 ..	2·5 ..	0 ..	1·3 ..	0 ..	95·9
6 ,, . . .	0·0 ..	0·5 ..	0 ..	6·8 ..	0 ..	92·7
10 ,, . . .	0·3 ..	0·2 ..	0 ..	15·9 ..	0 ..	83·6
13 ,, . . .	0·3 ..	0·3 ..	0 ..	32·0 ..	0 ..	67·4
16 ,, . . .	0·4 ..	0·3 ..	0 ..	74·9 ..	0 ..	24·4
25 ,, . . .	0·3 ..	0·2 ..	0 ..	87·3 ..	0 ..	12·2
39 ,, . . .	0·5 ..	0·3 ..	0 ..	90·5 ..	0 ..	8·7
104 ,, . . .	0·8 ..	0·0 ..	0 ..	95·7 ..	0 ..	3·5
Total gas removed in 104 days, 4930 c.c.						
Coal No. 23.[1]	Dry in Closed Bottles.					
10 days. . .	0·5 ..	0·0 ..	0 ..	18·9 ..	0 ..	80·6
34 ,, . . .	0·0 ..	0·1 ..	0 ..	73·3 ..	0 ..	26·6
71 ,, . . .	0·6 ..	0·3 ..	0 ..	72·0 ..	0[4] ..	27·1
Total gas removed in 104 days, 770 cc.						
Coal No. 21.[2]	Dry in Closed Bottles.					
35 days. . .	0·4 ..	0·0 ..	0 ..	51·4 ..	0 ..	48·2
Gas removed in 104 days, 770 c.c.						

[1] O'Gara No. 8 Mine, Saline Company (Ill.). Sample mined 19 days before storing.
[2] Herrin, Williamson Company, (Ill.). Sample mined 28 days before storing.
[3] Hydrogen was determined separately only in the analysis at 104 days. Hence the higher hydrocarbons of the paraffin series could not be calculated except in that analysis, and none was found there.
[4] Hydrogen tested for by palladium method.

The gas liberated in the above cases consists almost entirely of methane with a very slight amount of carbon dioxide, and no more than doubtful traces of carbon monoxide and heavy hydrocarbons. No hydrogen could be detected by the palladium fractional combustion method. Whether this gas may properly be considered as volatile matter due to the decomposition of the coal or whether it is held in the coal as such by occlusion or absorption, cannot be decided without further study. The fact that the oxygen of the air surrounding the coal is rapidly absorbed without forming carbon dioxide indicates a change of composition in the coal. By comparison of the analyses at the ten-day period from dry and immersed coal, it may be seen that more methane has been formed by the dry coal, since the gas sample in this case represents a larger volume of gas. It is reasonable to suppose that a larger quantity of gas escaped between the mining of the coal and the starting of the experiments than was measured during the experiments. The measurement of the quantity of gas formed is therefore of little value. The gas pressure in the case of No. 23, immersed, reached at one time 7 inches of mercury.

Volatile Matter at 105°.

A series of experiments conducted primarily for the direct weighing of moisture driven off from the coal at 105° yielded results incidentally which showed the extent of the loss of substances other than moisture. Ten grammes of air-dried, powdered coal in a 20 cm. copper boat were heated at 105° in a current of dry air in a glass tube. The gaseous products passed out of the tube into a train consisting of two $CaCl_2$ U-tubes, a tube of soda lime, and a U-tube containing platinized asbestos at 300°, preceded and followed by a bulb of clear lime water. A blank test in which 5 cc. of natural gas (94 per cent. CH_4) mixed with 95 cc. of air were passed through the apparatus gave a very distinct precipitate in the second lime-water bulb, while a blank with air alone showed none. The results in Table II. were obtained with three typical coals.

It may be seen from the results given that a slight amount of carbon dioxide is produced by drying the Illinois and Wyoming coals at 105° for two hours (whether in air or in nitrogen), but only slight traces of hydrocarbons or carbon monoxide. The direct moisture weighings in air and in nitrogen show that oxidation of the coal has occurred to the extent of 0·4 to 0·5 per cent. (as increase in weight of coal). The direct moisture weighed is

TABLE II.

Coal No.		Time of Drying.	Loss in Weight.	Moisture Weighed.	CO_2 Weighed	Hydrocarbons or CO.	Remarks.
16	(1)	2 hours	0·46	0·62	0·01	None	
16		2 ,,	0·46	0·60	0·00	Faint trace	
16		4 ,,	0·45	0·68	0 01	,, ,,	
16		2 ,,	0·53	0·66	0·02	..	In nitrogen
23	(2)	2 ,,	2·06	2·44	0·06		
23		2 ,,	2·15	2·55	0·04	Trace	
23		4 ,,	2·07	2·69	0·19	Consid'rable	
23		2 ,,	2 35	2·52	0·04	..	In nitrogen
5	(3)	2 ,,	9·14	9·53	0·36		
5		2 ,,	8·94	9·00	0·30	Faint trace	
5		4 ,,	9·36	9·93	0·46	Trace	
5		2 ,,	9·23	9·13	0·27	..	In nitrogen

(1) Pocahontas (W. Va.). Official moisture, 0·47 per cent.
(2) O'Gara, Saline Company (Ill.). Official moisture, 2 30 per cent.
(3) Sheridan (Wyo.) sub-bituminous. Official moisture, 9·40 per cent.

greater in almost every case than the official moisture (determined at about the same time).

Volatile Matter at 500° to 1100°.

In studying the nature of the volatile matter at the medium and higher temperatures (500° to 1100°) two sets of experiments were run, using a different apparatus in each. In one (see fig. 2) a small sample (10 grammes) was heated in a platinum retort suspended in an electric resistance furnace maintained constant at the desired temperature; the gases evolved being collected by displacement of water in a bottle.

No attempt was made in this set of experiments to duplicate the methods or results of industrial practice. The apparatus was designed with the idea of maintaining definite and controllable conditions which would yield results comparable with each other in experiments on different coals. The other set of experiments (see fig. 1) was run on a somewhat larger scale—heating 400

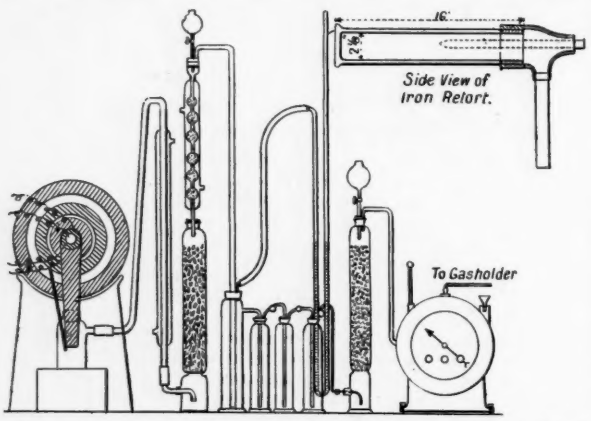


Fig. 1.—Apparatus for Collecting Bye-Products from the Coking of Coal.

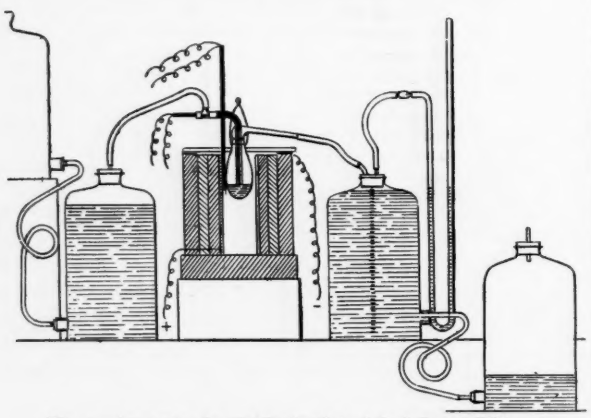


Fig. 2.—Apparatus for the Production of Coal Gas at Different Temperatures.

grammes of coal in a cast-iron retort resting in a cylindrical electric resistance furnace; the tar, water, ammonia, carbon dioxide, hydrogen sulphide, and gas being collected in appropriate absorption apparatus and measured. Owing to the heavy nature of the retort and the large sample of coal, the temperature in the coal could not be varied as easily in these experiments as in those using the platinum retort. Accordingly, one set of conditions was adopted approximating as nearly as possible those of industrial bye-product coke-oven practice, and a number of typical coals compared under these conditions. The object was rather to compare the different coals with each other under this set of conditions than to determine absolutely the industrial yields of bye-products, and further to determine the composition of the volatile matter from different coals under these conditions.

The coal, crushed to buckwheat size, was placed in the inner end of the retort; a 10 cm. layer of coke added; and the retort made tight. The furnace having been heated to 1050°, the retort was introduced and the bye-product apparatus connected. The heating was continued until gas practically ceased to be formed—usually about 1½ hours. The temperature in the interior of the coal rose to 700° in from 25 to 30 minutes. The mixed tar and aqueous liquor, after being weighed in the absorption vessels, was washed out with a measured amount of water. The mixture was separated for determination of water, first by decantation and then by distillation of the tar; the water was measured; and the aqueous liquor was then distilled for ammonia. The carbon dioxide and hydrogen sulphide were absorbed in a strong solution of potassium hydroxide, on which blank determinations had been run; the carbon dioxide was determined by evolution with acid; and the hydrogen sulphide by titration with iodine. The gas, after passing through a meter, was collected over water and then analyzed. The following results were obtained on four typical coals:—

TABLE III.

Test No.	No. and Origin of Coal.	Coke. Per Cent.	Tar. Per Cent.	Water. Per Cent.[1]	Ammonia. (Pounds of Sulphate per Ton.)	CO_2.	H_2S.	Gas. Cub. Ft. per Ton at 0° C. and 760 mm.)
33	16—Pocahontas .	79·1	7·2	1·0	13·2	0·44	0·08	10,180
34	,, ,, .	79·1	7·2	1·5	12·5	0·43	0·06	9,210
15	3—Connellsville[2] .	70·0	12 5	4·5	18·2	..	..	8,070
39	,, ,, .	73·5	14·4		25 0	0·71	0·28	8,650
31	23—O'Gara (Ill.) .	63·1	12·3	11·0	26·4	1·20	0·47	8,400
32	,, ,, .	63·1	11·5	10·3	24·1	1·19	0·44	8,400
40	11—Sheridan (Wyo.)	45·0	6·8	29·0	29·1	8·03	0·10	7,740[3]
37	11—Air-dried .	52·9	5·3	19·0	28·2	8·62	0·12	8,540[3]
38	,, ,, .	53·1	5·6	19·0	25·1	8·20	0·10	7,790[3]

Analysis of Coal.

No. of Coal.	Moisture.	Volatile Matter.	Fixed Carbon.	Ash.	Sulphur.	Nitrogen.
16	1·16	20·76	74·90	3·18	0·61	1·07
3	1·18	30 64	60·30	7·88	0·95	1·23
23	7·07	30·37	53·80	8·76	1·48	1·27
11 (Air-dried) . . .	11·45	38·83	44·65	5 07	0·45	1·32
11 (As received) . .	21·96	34·25	39·22	4·57	0·39	1·18

Analysis of Average Gas from above Tests.

[Calculated to air-free.]

Test No.	CO_2.	C_6H_6.	C_2H_4.	CO.	CH_4.	H_2.	N_2.
33	..	0·3	1·5	3·1	26·0	69·0	0·1
34	..	0·3	0·7	3·3	26 8	66·5	2·4
15	0 5	1·5	2·0	5·0	28·3	55·4	7·3
39	..	1·8	1·7	5·2	26·4[4]	60·4	4·5
31	0·1	1·7	1·3	7·3	29·7	56·2	3·7
32	..	1·1	1 8	7·5	22·8	57·3	9·5
40	..[5]	1·2	1·4	17 8	18·1[6]	54·0	7·5
36	..[5]	1·2	1·3	21·2	21·4	51·6	3·3
37	..[5]	1·1	1·5	21·6	23·7	47·0	5·1

[1] Includes moisture of coal.
[2] 600 grammes of coal used in this test. Rate of heating slower than in other tests.
[3] Calculated to CO_2-free basis.
[4] Includes 20·4 per cent. CH_4 + 6 per cent. C_2H_6, calculated as described below under methods of gas analysis.
[5] Calculated to CO_2-free basis.
[6] Includes 14·9 per cent. CH_4 + 3·2 per cent. C_2H_6, calculated as described below under methods of gas analysis.

On the basis of the above results, the composition of the volatile products may be stated in the following percentages of the coal as used:—

TABLE IV.—*Bye-Products from 400-Gramme Tests.*

Coal No.	Total Volatile[1].	True Volatile (without Moisture).	Tar.	Water.	NH_3.	CO_2.	H_2S.	Gas (by Difference).	Water of Constitution.[2]
16 . .	20·9	19·7	7·2	1·3	0·17	0·44	0·07	11·7	0·2
3 . .	28·2	27·0	11·0	4·5	0·28	0·71	0·28	11·4	3·3
23 . .	36·9	29·8	11·9	10·7	0·33	1·20	0·46	12·3	3·6
11 . .	55·0	33·0	6·8	29·0	0·38	8 03	0·10	10·7	7·0
11 air-dried	47·0	35·5	5·5	19·0	0·35	8·41	0·11	13·6	7·5

[1] Difference between average coke yield and 100; therefore includes moisture.
[2] Total water *minus* moisture.

TABLE V.—*Relative Percentages of Combustible and Inert Volatile Matter.*

Number of coal	16.	3.	23.	11.	11 (air-dried).
Combustible volatile matter . . .	18·9	22·7	24·7	17·6	19·2
Inert ditto[1] (not including moisture)	0·8	4·3	5·1	15·4	16·3

[1] Does not include moisture or free nitrogen of gas. Values obtained by difference between volatile (without moisture) and tar + gas + H_2S.

The inert volatile matter in various types of coal has been calculated by Parr on theoretical considerations as to the behaviour of coal. Parr's calculations are based on curves which smooth out the irregularities of Dulong's calculation of available hydrogen from analytical data. Parr's values for inert volatile are in most cases considerably higher than those shown by the above experimental results. But the fact remains that the inert constituent of the volatile matter is a considerable quantity, varying in different coals and of importance in the differentiation of coal types.

No definite conclusions as to comparative bye-product yields should be drawn from these tests. They serve rather as indications of differences in behaviour which require corroboration by a considerable number of parallel experiments. It may, however, be said that apparently the ammonia yield by this laboratory method is even larger from the low-grade coals of the interior and western fields than from the high-grade eastern coals. The high yield of gas of thin quality from Pocahontas coal and its low ammonia and water yields accord with the results of commercial practice. In general, the yield of tar is greater and that of gas less in the laboratory tests than in commercial practice, which is due most probably to the slower distillation in the laboratory method and the unavoidable cooling of the furnace at the start by the cold iron retort.

TABLE VI.—*Average Results on* 10 *Grammes of Air-Dried Coal.*

Coal.	Highest Temp. in Coal.	Tar. Per Ct.	Water. Per Ct.	Gas. Per c.c.	Composition of Gas (Calculated to Undiluted Gas). CO_2.	Illum. Power.	CO.	CH_4.	C_2H_6.[1]	H_2.	N_2.
					Ten Minutes' Heating at 500°.						
3	335	..	..	8	30·0	..	6·5	6·5	7·0	..	50·0[2]
1	325	..	..	90	14·8	..	5·3	8·0	..	..	71·9[2]
					Ten Minutes' Heating at 600°.						
3	441	4·9	3·2	190	6·3	8·2	5·9	36·9	23·7	2·0	17·0[3]
1	440	6·8	13·0	173	15·7	7·0	14 4	19 0	22·2	2·8	18·9[3]
					Ten Minutes' Heating at 700°.						
3	562	11·0	3·5	583	3·0	7·2	5·4	44·1	17·7	13·5	9·1
1	545	7·8	14·0	471	8·5	5·1	13·7	59·6	..	1·1	12·0
5	580	8·2	18·5	1020	28·8	3·7	20·0	18·6	6·8	15·1	7·0
16	599	4·2	1·9	675	1·9	4·4	3·9	44·4	16·1	28·5	0·8
					Ten Minutes' Heating at 800°.						
3	687	12·6	4·5	1375	1·5	5·5	6·9	24·9	12·1	33·1	16·0[3]
1	680	9·3	13·9	1251	3·8	3·8	16·0	27·7	6·1	33·7	8·9[3]
5	..	7·9	19·1	1780	19·8	2·7	21·4	14·1	4·0	30·0	8·0
16	..	6·5	2·4	1590	1·2	3·4	4·8	24·4	11·6	43·2	11·4

Analysis of Coal.

	Moisture.	Volatile Matter.	F.C.	Ash.	Origin of Coal.
3	1·10	30·67	60·35	7·88	Connellsville (Pa.).
1	7 67	30·38	54 32	7·63	Ziegler (Ill.).
5	9·15	39·93	42·92	8·00	Sheridan (Wyo.).
16	0·35	20·93	75·51	3·21	Pocahontas (W. Va.).

[1] Includes all higher paraffin hydrocarbons calculated as C_2H_6. See description of gas analysis methods below.
[2] Includes small amount of air.
[3] Special test, heating neck of retort to redness.

Particular attention should be drawn to the wide variation in carbon dioxide, carbon monoxide, and water of constitution produced by the destructive distillation of the different coals.

Experiments on 10 *Grammes of Coal.*

The series of tests in a platinum retort on 10 grammes of coal at various temperatures is not yet completed, but has yielded sufficient results to show their approximate agreement with those obtained on 400 grammes of coal and also to indicate the composition of the gas produced from different coals in the early stages of heating at low temperatures. A thermocouple was inserted in the retort so as to determine the temperature under the surface of the coal itself. The tests were run in an atmosphere of nitrogen which was passed through the retort until the exit gases contained less than 1 per cent. of oxygen. The tar was collected in two 6-inch tubes of absorbent cotton heated to 100° and also weighed on the neck of the retort. The water was collected in a 5-inch calcium chloride U-tube, and always contained a slight amount of light oil driven over from the tar, causing an error of 1 per cent. or less.

The results given in Tables VI. and VII. are in most cases averages of two or more parallel tests at each temperature. The following tabular statements show the detailed results of separate tests; and from these the averages given were compiled:—

TABLE VII.—*Average Results on Total Gas from* 10 *Grammes of Air-Dried Coal.*

Coal No.	Furnace Temp.	Highest Temp. in Coal.	Gas (c.c.)	Composition of Gas (Calculated to Undiluted Gas). CO_2.	Illum.	CO.	CH_4.	C_2H_n[1].	H_2.	N_2.
3.	500	390	150	11·2	5·3	5·2	4·5	32·5	..	41·3
1.	500	390	130	21·0	5·6	13 3	16·4	14·8	..	28·9
3.	600	474	626	3·4	5·7	5·3	41·2	18·9	10·9	14·6
1.	600	480	535	6·7	4·3	13·9	34·1	13·6	14·2	13·2
3.	700	589	1220	2·7	3·8	5·3	36·2	12·9	27·0	12·1
1.	700	585	978	5·7	3·6	19·1	30·0	7·7	24·1	9·8
5.	700	604	1300	20·4	3·3	20·2	22·4	5·3	22·4	5·0
16.	700	617	1183	1·3	3·2	4·8	42·0	10·0	32·9	5·8
3.	800	705	1723	2·0	4·3	7·0	36·0	9·5	38·1	3·1
1.	800	685	1550	3·6	3 0	15·7	27·1	5·0	38·5	7·1
3.	900	812	2080	1·1	4·7	7·2	25·2	7·1	52·0	2 7
3[2]	900	830	2750	1·3	4·8	7·3	27·1	3·4	52·6	3·5
1.	900	811	2335	2·2	3·0	14·5	20·7	6·0	48·7	4·9
1[3]	900	832	2380	2·5	2·6	14·0	21·8	4·7	47·9	5·5
3.	1000	922	2900	1·1	4·3	5·9	24·4	3·0	56·0	5·3
1.	1000	920	2700	2·5	3·6	14·4	18·1	3·9	52·6	4·9
5.	1000	920	3650	9·9	4·3	21·2	11·7	3·8	44·2	4·9
5[4]	1070	990	2700	12·8	1·7	17·7	14·4	4·8	42·1	6·5
16.	1000	920	3230	0·4	3·6	4·4	22·5	3·2	61·8	4·1
3.	1100	1010	3530	1·0	4·9	7·0	21·5	3·8	58·2	3·6
1.	1100	1026	3120	1·7	3·7	13·9	18·9	4·2	54·6	6·0
3[5]	960	845	2750	1·7	4·7	8·2	29·8	3·5	50·5	1·6
1[5]	960	859	2500	3·2	3·8	16·6	20·0	4·8	51·0	0·6

[1] Includes all higher paraffin hydrocarbons calculated as C_2H_6.
[2] Special test, heating neck of retort to redness.
[3] Special test on 10 grammes running in air instead of in nitrogen. Gas contains 1 per cent. of oxygen and very little more carbonic acid than in the corresponding test run in nitrogen.
[4] Special test, heating gradually during 50 minutes.
[5] Approximation of official volatile determination, heating 1 gramme for 7 minutes.

TABLE VIII.—*Coal No.* 3 (*Connellsville*), *Ten-Minute Period.*

Test No.	66.	70.	72.	75.	64.	65.	67.	80.	86.
Furnace temp..	500	600	600	600	700	700	700	800	800
Coal temperature—									
1 min. . .	50	65	50	55[1]	75	80	85	125	70
2 ,, . .	80	125	130	75	180	175	180	215	250
3 ,, . .	140	200	225	150	300	300	300	375	385
4 ,, . .	180	255	300	220	380	370	380	445	450
5 ,, . .	225	325	345	275	430	415	430	510	520
6 ,, . .	260	370	385	315	463	460	460	550	..
7 ,, . .	285	405	408	360	590	485	487	610	590
8 ,, . .	305	425	430	380	510	510	507	655	650
9 ,, . .	325	440	445	400	535	530	540	680	675
10 ,, . .	335	455	452	415	565	555	565	695	679
Gas yield in cub. cent. per 10 grammes.	8	162	233	176	668	522	560	1400	1350
Gas composition[2]—									
CO_2 . . .	30·0	6 7	5·7	6·4	3·2	2·6	3·3	1·8	1·2
C_6H_6 . . .	..	5·4	3·1	6·0	4·8	4·9	4·7	3·1	2·7
C_2H_4 . . .	..	3·4	4·1	2 6	2·5	2·3	2·4	2·8	2·3
CO. . . .	6 5	6·1	5·3	6·4	4·6	6·9	7·6	7·1	6·6
CH_4 . . .	6·5	17·2	56·4	37·0	69·0	27·0	36·3	30·0	19·8
C_2H_6[3] . . .	7·0	32·4	14·0	24·6	4·5	27·5	21·2	10·2	14·0
H_2	..	5·4	0 6	..	3·5	20·8	16·1	30·8	35·3
N_2	..	17·8	1·9	11·0	14·0	8·0	8·4	10·3	16·4
Air. . . .	50·0	5·6	8·9	6·0	1·9	..	..	3·9	1·7
Tar per cent.[4] . . .		4·83	4·98	..	12·0	10·1	..	12·9	12·4
Water per cent.[4] . .		3·44	3 03	..	3·8	3·2	..	4·4	4·7

[1] Thermocouple accidentally placed somewhat higher than usual.
[2] Calculated to undiluted gas. Oxygen assumed to be present entirely as air.
[3] Includes all higher paraffin hydrocarbons calculated as C_2H_6.
[4] Separate tests from above gas tests.

Smoke Formation and Composition of Low Temperature Gases During Early Stages of Heating.

Börnstein has examined the gases and tars obtained by distilling German bituminous and brown coals at low temperatures (up to 450°). The gas he finds high in carbon dioxide and in the homologues of methane; the tar carries no solid aromatic hydrocarbons.

TABLE IX.—*Coal No.* 1 (*Illinois*), *Ten-Minute Period.*

Test No.	59.	69.	73.	62.	63.	76.	83.
Furnace temp.	500	600	600	700	700	800	800
Coal temperature—							
1 min.	70	70	60	..	95	75	..
2 ,, ...	85	85	..	160	150	150	180
3 ,, ...	125	170	135	250	230	305	..
4 ,, ...	165	220	..	335	315	410	435
5 ,, ...	215	290	290	390	380	505	570
6 ,, ...	345	340	330	440	450	550	590
7 ,, ...	270	380	370	470	480	610	625
8 ,, ...	290	405	395	505	510	635	660
9 ,, ...	315	430	420	535	530	655	678
10 ,, ...	325	445	435	550	540	670	689
Gas yield in cub. cent. per 10 grammes . . .	90	175	171	485	456	1224	1280
Gas composition[1]—							
CO_2[2]	14·8	15·6	15·7	8·7	8·3	3·7	3·9
C_6H_6.	..	4·0	1·3	3·0	3·0	2·1	1·0
C_2H_4.	..	2·8	5·9	2·3	1·9	1·6	2·8
CO	5·3	12·6	16·2	14·1	13·2	16·7	15·3
CH_4	8·0	23·6	14·3	60·2	59·0	..	27·7
C_2H_6[2]	..	21·6	22·9	..	..	..	6·1
H_2	..	4·6	0·9	0·9	1·3	..	33·7
N_2	34·9	6·2	19·7	4·7	7·9	..	7·8
Air	37·0	9·0	3·1	6·1	5·4	1 2	1·7
Tar per cent.[3]. . . .	..	6·84	..	7·5	8·1	9·3	..
Water per cent.[3] . . .	..	12·96	..	14·3	13·7	13·9	..

[1] Calculated to undiluted gas. Oxygen assumed to be due to air.
[2] Includes all higher paraffin hydrocarbons.
[3] Separate tests from above gas tests.

From our results given in Table VI. and in different form in Table XIV., it may be seen that the low temperature gases are high in illuminants and the higher homologues of methane, and low in hydrogen. Comparing the four coals at 700° (565° in the coal) where the gas begins to be formed in considerable amount, the Connellsville is the richest of the four coals in illuminants and heavy hydrocarbons, and the Pocahontas the highest in hydrogen. The high carbon dioxide and carbon monoxide from the Illinois and Wyoming coals accords with other experiments on these coals. The tar at 700° is greater also in the Connellsville coal. The smokeless character of the Pocahontas coal may be connected more or less with the presence of considerable hydrogen in its gas at low temperatures, since the low ignition point of hydrogen tends to assist in the burning of other gases present.

TABLE X.—*Coals Nos. 5 and 16, Ten-Minute Period.*

	No. 5 (Sheridan, Wyo.).				No. 16 (Pocahontas, W. Va.)			
Test No.	105.		114.		103.		115.	
Furnace temperature	700	700	800	800	700	700	800	800
Coal temperature—								
1 min	90	..	..	..	140	..	..	..
2 ,,	190	..	..	..	310	..	..	..
3 ,,	300	..	..	..	430	..	..	..
4 ,,	360	..	..	..	495	..	..	..
5 ,,	430	..	..	..	530	..	..	..
6 ,,	480	..	..	..	550	..	..	..
7 ,,	530	..	..	..	570	..	..	..
8 ,,	550	..	..	..	565	..	..	..
9 ,,	568	..	..	..	585	..	..	..
10 ,,	580	..	..	..	599	..	..	..
Gas yield in cub. cent. per 10 grammes	1020	..	1780	..	675	..	1590	..
Gas composition[1]—								
CO_2	28·8	..	19·8	..	1·9	..	1·2	..
C_6H_6	2·3	..	1·7	..	2·8	..	2·1	..
C_2H_4	1·4	..	1·0	..	1·6	..	1·3	..
CO	20·0	..	21·4	..	3·9	..	4·8	..
CH_4	18·6	..	14·1	..	44·4	..	24·4	..
C_2H_6[2]	6·8	..	4·0	..	16·1	..	11·6	..
H_2	15·1	..	30·0	..	28·5	..	43·2	..
N_2	7·0	..	8·0	..	0·8	..	11·4	..
Tar, per cent.	8·5	7·83	7·8	7·95	..	4·19	6·15	6·74
Water, per cent.	18·0	18·90	19·4	18·80	..	1·93	2·58	2·19

[1] Calculated to undiluted gas; oxygen assumed to be present entirely as air.
[2] Includes all higher paraffin hydrocarbons calculated as C_2H_6.

From Table XIV. the bearing of these results on smoke formation may be seen. The smoke producing constituents of the volatile matter are here considered as including tar, and the heavier hydrocarbon gases—benzene, ethylene, and homologues of methane (calculated at C_2H_6). While at 440° (in the coal) the Illinois coal (and probably also the Wyoming) has produced more smoky gases than the Eastern coals, at 565° and higher, the Connellsville produces much more. This accords with the finding in practice of greater difficulty in burning coals of the Connellsville type without smoke.

Methods of Gas Analysis.

For the determination of CO_2, C_6H_6, C_2H_4, O_2, and CO the well-known apparatus of Hempel was used. For benzene, sulphuric acid (specific gravity 1·84) was the reagent used, as recommended by Morton. For ethylene (or total illuminants), fuming sulphuric acid (specific gravity 1·53) was used in a double pipette provided with glass beads. For carbon monoxide, an ammoniacal solution of cuprous chloride (according to Winkler's formula) was used for which three double pipettes were employed successively on each sample.

Hydrogen was determined in most cases separately by fractional combustion over palladium asbestos as recommended by Professor F. C. Phillips. Palladium black was precipitated upon acid-washed ignited asbestos, by the action of alkaline sodium formate upon palladium chloride solution, and the product then washed, dried, and ignited at a moderate red heat. A mixture of the gas residue and air, equivalent to a hydrogen-oxygen ratio of not more than 1 : 2 by volume, was passed slowly over the palladium in a small U-tube maintained at about 50° by a water bath, and the contraction measured. According to Professor Phillips, hydrogen is completely burned under these conditions and hydrocarbons are not affected. We have verified this statement by tests with

TABLE XIV.—*Absolute Quantities of Smoking and Non-Smoking Products in Ten Minutes' Heating of 10 Grammes of Coal.*

[Compiled from results given in Table VI.]

Coal No.	Temperature.		Smoking Products.				Non-Smoking Gases (Cub. Cent.).				
			Tar per Cent.	Gas (Cub. Cent.).							
	Furnace.	Coal.		Illum.	Ethane, &c.	Total	CO_2	CO.	CH_4	H_2	Total.
3	500	335	..	..	0·6	0·6	2·4	0·5	0·5	..	3·4
1	500	325	..	..	..	..	13·5	4·7	7·2	..	25·4
3	600	441	4·9	16	46·0	61·0	12·0	11·0	71·0	4	98·0
1	600	440	6·8	12	39·0	51·0	28·0	25·0	33 0	5	91·0
3	700	562	11·0	42	103·0	145·0	18·0	31·0	256·0	78	383·0
1	700	545	7·8	24	..	24·0	40·0	64·0	281·0	5	391·0
5	700	580	8·2	38	69·0	107·0	294·0	204·0	190·0	154	842·0
16	700	599	4·2	30	109·0	138·0	13·0	27·0	300·0	192	532·0
3	800	687	12·6	76	166·0	242·0	21·0	95·0	343·0	458	917·0
1	800	680	9·3	47	76·0	123·0	47·0	200·0	346·0	420	1013·0
5	800	..	7·9	48	72·0	120·0	355·0	381·0	254·0	534	1524·0
16	800	..	6·5	54	186·0	240·0	19·0	77·0	390·0	691	1177·0

TABLE XI.—*Total Gas from 10 Grammes of Air-Dried Coal.—Coal No. 1 (Ziegler, Ill.).*

Test No.	60	71	78	68	81	85	93	88	97	90	99
Furnace temperature, degrees	500	600	600	700	700	800	800	900	900	1000	1100
Coal temperature—2 min.	85	115	85	155	150	..	230	340	450	570	840
,, ,, 4 ,,	175	280	175	320	360	500	470	660	700	820	970
,, ,, 6 ,,	220	390	300	445	470	600	600	755	807	905	1025
,, ,, 8 ,,	265	435	370	520	520	650	660	790	832	920	1025
,, ,, 10 ,,	330	462	410	550	550	670	681	797	825	915	1026
,, ,, 15 ,,	375	487	457	578	572	675	689	789	822	912	1020
,, ,, 20 ,,	390	490	469	580	575	679	689	785	820	910	..
,, ,, 30 ,,	390	490	470	582	579	676	691	788	821	900	..
,, ,, 40 ,,	390	485	470	583	578	672	690	785	810	..	..
,, ,, 50 ,,	390	485	469	588	580	679	689	..	815	..	..
,, ,, 60 ,,	390	490	468	588	575	679	690	..	..	..	..
,, ,, 70 ,,	..	..	..	590	579	..	..	..	..	..	..
Gas yield in cub. cent. per 10 grammes	130	570	500	965	990	1500	1630	2290	2380	2700	3120
Gas composition[1]—CO_2	20·0	6·4	7·0	5·1	6·2	3·4	3·7	2·2	2·5	2·5	1·7
,, ,, C_6H_6	..	2·0	3·0	2·2	2·4	1·6	1·5	2·0	1·3	1·2	1·0
,, ,, C_2H_4	5·6	2·0	1·6	0·9	1·7	1·8	1·2	1·5	1·3	2·4	2·7
,, ,, CO	13·3	14·3	13·4	22·0	16·0	16·0	15·3	14·8	14·1	14·4	14·9
,, ,, CH_4	16·4	39·2	29·0	34·4	25·5	23·8	30·3	19·3	22·0	18·1	13·9
,, ,, C_2H_6[2]	14·8	10·6	16·5	7·7	7·6	4·8	5·1	6·9	4·8	3·9	4·2
,, ,, H_2	..	11·9	16·3	21·9	26·0	40·4	36·6	49·1	48·4	52·6	54·6
,, ,, N_2	28·9	13·6	13·2	5·8	14·5	8·2	6·3	4·2	5·6	4·9	6·0

[1] Calculated to undiluted gas. Oxygen assumed to be present entirely as air. [2] Includes all higher paraffin hydrocarbons calculated as C_2H_6.

TABLE XII.—*Coal No. 3 (Connellsville, Pa.).*

Test No.	61	74	79	84	77	82	87	94	89	92	106
Furnace temperature, degrees	500	600	600	600	700	700	800	800	900	1000	1100
Coal temperature—2 min.	105	130	100	75	140	155	285	385	450	600	600
,, ,, 4 ,,	210	290	240	260	340	370	460	535	630	740	880
,, ,, 6 ,,	280	385	360	360	440	455	550	..	720	905	1010
,, ,, 8 ,,	320	415	410	405	490	498	655	..	800	922	1005
,, ,, 10 ,,	347	435	438	435	555	550	685	708	812	918	999
,, ,, 15 ,,	375	470	483	478	579	572	692	711	803	913	1000
,, ,, 20 ,,	384	465	477	472	582	578	692	714	801	905	..
,, ,, 30 ,,	392	460	473	474	580	575	691	714	..	914	..
,, ,, 40 ,,	390	462	475	475	590	575	690	719	..	..	..
,, ,, 50 ,,	390	462	475	477	578	588	688	..	..	..	..
,, ,, 60 ,,	390	465	479	479	590	580	692	..	..	..	..
,, ,, 70 ,,	..	..	476	..	..	..	690	..	..	..	..
Gas yield in cub. cent. per 10 grammes	150	443	730	705	1280	1160	1685	1760	2080	2900	3530
Gas composition[1]—CO_2	11·2	3·0	3·7	3·4	3·2	2·2	1·7	2·2	1·1	1·1	1·0
,, ,, C_6H_6	4·1	..	3·7	1·8	2·8	..	2·5	2·1	2·3	1·5	1·3
,, ,, C_2H_4	1·2	5·6	2·0	4·0	1·1	3·6	2·0	1·9	2·4	2·8	3 6
,, ,, CO.	5·2	6·0	6·0	4 0	4·8	5·8	6·9	7·1	7·2	5·9	7·0
,, ,, CH_4	4·5	56·4	35·3	32·0	32·9	39·5	35·0	37·0	25·2	24·4	21·5
,, ,, C_2H_6[2]	32·5	17·0	22·8	17·0	14·4	11·4	11·0	8·0	7·1	3·0	3·8
,, ,, H_2	..	2·3	17·2	13·3	26·9	27·0	38·5	37·6	52·0	56·0	58·2
,, ,, N_2	41·3	9·7	9·3	24·5	13·9	10·5	2·4	4·1	2·7	5·3	3·6

[1] Calculated to undiluted gas. Oxygen assumed to be present entirely as air. [2] Includes all higher paraffin hydrocarbons calculated as C_2H_6.

TABLE XIII.—*Miscellaneous Tests under Varied Conditions.*

—	Coal No. 1.		Coal No. 3.			Coal No. 3 (Wyo.).			Coal No. 16 (Pocahontas).		
Test No.	91	98	95	108[3]	89	101	104	102	96	100	107
Furnace temperature, degrees	1	2	2	900	900	700	1000	1070[4]	700	700	1000
Coal temperature—1 min.	650	600	500	..	..	130	..	110	125	170	420
,, ,, 2 ,,	865	830	790	440	450	240	600	170	240	280	620
,, ,, 3 ,,	865	850	835	560	..	360	790	240	380	445	690
,, ,, 4 ,,	850	859	845	630	630	430	900	300	440	492	740
,, ,, 5 ,,	848	850	843	690	..	495	..	370	490	532	830
,, ,, 6 ,,	842	849	..	760	720	530	..	410	510	552	892
,, ,, 7 ,,	840	849	840	820	..	560	..	460	532	552	912
,, ,, 10 ,,	..	..	..	830	812	600	920	550	590	600	920
,, ,, 15 ,,	..	..	..	814	803	600	915	609	614	615	..
,, ,, 20 ,,	..	..	..	811	801	604	903	680	610	620	908
,, ,, 40 ,,	..	..	..	..	..	604	912	990	650	619	915
,, ,, 60 ,,	..	..	..	..	..	..	..	..	..	..	..
Gas yield in cub. cent. per 10 grammes	2600	2500	2750	2750	2080	1300	3650	2700	1190	1175	3230
Gas composition[5]—CO_2	3·1	3·2	1·7	1·3	1·1	20·4	9·9	12·8	1·1	1·4	0·4
,, ,, C_6H_6	1·3	1·8	1·7	1·9	2·3	2·0	2·1	1·1	1·4	1·8	1·1
,, ,, C_2H_4	4·1	2·0	3·0	2·9	2·4	1·3	2·2	0·6	1·8	1·4	2·5
,, ,, CO	15·6	16·6	8·2	7·3	7·2	20·2	21·2	17·7	4·9	4·7	4·4
,, ,, CH_4	18 0	20·0	29·8	27·1	25·2	22·4	11·7	14·4	43·6	40·5	22·5
,, ,, C_2H_6[6]	4·4	4·8	3·5	3·4	7·1	5·3	3·8	4·8	8·9	11·1	3·2
,, ,, H_2	52·0	51·0	50·5	52·6	52·0	22·4	44·2	42·1	32·1	33·6	61·8
,, ,, N_2	1·5	0·6	1·6	3·5	2·7	5·0	4·9	6·5	6·2	5 5	4·1

[1] Approximation of official volatile method, 1 gramme of coal, 7 minutes.
[2] Ditto, slightly lower temperature.
[3] Top and delivery tube of retort heated to redness for 2-inch space.
[4] Slow elevation of temperature, approximating Somermeier's modified method for volatile matter.
[5] Calculated to undiluted gas.
[6] Includes all higher paraffins calculated as C_2H_6.

pure electrolytic hydrogen and with natural gas (testing for carbon dioxide formation).

Methane and its higher homologues were determined by the slow combustion method of Winkler as modified by Dennis and Hopkins. The combustion pipette was of glass; the platinum spiral was heated by a direct current of 120 v. 6-8 amp.; and in order to assist in the combustion and reduce the necessary temperature, a few threads of platinized asbestos were inserted in the platinum spiral. The contraction and carbon dioxide formed were measured.

Hydrogen having been separately determined, the contraction due to its combustion is known, and may be subtracted from the total contraction obtained by the complete burning in the Winkler pipette. The remainder is contraction due to the burning of hydrocarbons. If we assume only two hydrocarbons present—viz., methane and ethane—and know the contraction and carbon dioxide formed from their combustion, we can calculate their amount as follows:—

One volume CH_4 gives, on burning, one volume CO_2, and two volumes contraction.

One volume C_2H_6 gives two volumes CO_2 and two-and-a-half volumes contraction.

Therefore,

contraction found $= 2CH_4 + 2\frac{1}{2}\ C_2H_6$.

CO_2 found $= CH_4 + 2C_2H_6$.

Solving for CH_4 and C_2H_6:

$CH_4 = 1/3\ (4 \text{ contraction} - 5CO_2)$.

$C_2H_6 = 1/3\ (4CO_2 - 2 \text{ contraction})$.

The values thus obtained for the higher homologues of methane must be considered as merely approximate, since several compounds are probably present whose average composition is uncertain. In case the higher homologues include others besides ethane (C_2H_6), their total percentage will be less than the above calculation shows.

Composition of Gas Formed in the Official Volatile Determination.

By means of a thermocouple inserted through the lid of the crucible until it rested under the surface of the coal, a measurement of temperature in the coal was obtained during the official volatile determination in a platinum crucible.

TABLE XV.—*Temperature (in Degrees) During Official Volatile Determination.*

Time, minutes.	½.	1.	1½.	2.	2½.	3.	3½.	4.	5.	6.	7.
Empty	300	500	670	750	770	780	790	795	799	800	800
Coal No. 1	200	530	720	800	825	830	832	832	832	830	830
,, No 3	180	420	570	750	820	835	..	837	839	840	839

In order to determine the composition of the gas formed during the official volatile determination, two tests were run in the platinum retort on 1 gramme of coal for seven minutes at temperatures corresponding as nearly as practicable with the above. The retort was filled with nitrogen. The results are given at the end of Table VII. An attempt was also made to measure the tar and water formed in the official volatile determination; but on account of the analytical difficulties in collecting these products from so small a sample of coal (1 gramme), concordant results have not as yet been obtained. There are also given in Table VII. the results of a special test on Wyoming sub-bituminous coal (No. 5) in which the heating was very gradual. A smaller gas yield by 25 per cent. was obtained and a gas of higher carbon dioxide but lower illuminants than in the case of rapid heating to the same temperature.

Calculation of the Heat Value of Coal from its Ultimate Analysis.

The experimental results here given show conclusively that in the process of breaking-down under the influence of heat the coal substance gives up its oxygen partly in the form of carbon-oxygen compounds and partly as the hydrogen-oxygen compound water. Some recent work by Vignon in Europe supports this conclusion. The figures demonstrating this point are given again below in more compact form.

TABLE XVI.—*Percentages of Air-Dried Coal.*

	Oxygen Compounds in Volatile Matter.[1]		Oxygen Relations in Volatile Matter			
Coal.	CO_2.	CO.	Water of Constitution.	Oxygen in CO & CO_2.	Oxygen in Water of Constitution.	Oxygen in Dry Coal.
No. 16 (Pocahontas)—						
400-gramme tests	0·44	1·21	0·2	1·01	0·09	3·18
10 ,, ,,	0·26	1·76	—	1·21	—	—
No. 3 (Connellsville)—						
400-gramme tests	0·71	1·47	3·3	2·01	2·93	5·23
10 ,, ,,	0·64	2·14	—	1·55	—	—
No. 23 (O'Gara, Ill.)—						
400-gramme tests	1·24	2·88	3·6	2·55	3·20	8·60[2]
No. 1 (Ziegler, Ill.)—						
400 gramme tests	2·72	4·26	—	4·41	—	9·12
10 ,, ,,	1·35	4·86	—	3·75	—	—
No. 11 (Sheridan, Wyo.)—						
400-gramme tests	8·60	6·90	7·5	10·19	6·67	16·63
10 ,, ,,	7·28	9·67	—	10·81	—	—

[1] There is a possibility of the formation of carbonic acid in slight amount from the oxygen of air in contact with the coal at the beginning of a test. Assuming 500 c.c. of air in contact with the coal, there should be formed, if all its oxygen entered into carbonic acid, only 0·28 gramme of the acid, or 0·07 per cent. on 400 grammes of coal.
[2] From analysis of Illinois 31 (U.S. Fuel-Testing Plant), a similar coal.

Dulong's calculation of heat value from ultimate analysis assumes that all of the oxygen of the coal combines with the hydrogen of the coal during combustion, thereby neutralizing, so to speak, the calorific value of hydrogen equal to O/8. Dulong's calculation, as is well known, gives in many cases less calories than are shown by experimental determination. These cases of discrepancy are usually medium and low-grade coals, high in oxygen, which, as we have shown, give up their oxygen in large part combined with carbon instead of with hydrogen.

By combining with carbon instead of with hydrogen in the coal, the oxygen exercises less of an anti-calorific influence on the efficiency of the coal, since 1 gramme of oxygen in combining with carbon to CO_2 neutralizes $\frac{3}{8}$ gramme of carbon or 3030 potential calories; with carbon to CO it partly neutralizes $\frac{3}{4}$ gramme of carbon, thus neutralizing $\frac{3}{4}$ (2490) = 1870 calories; while 1 gramme of oxygen in combining with hydrogen to H_2O neutralizes $\frac{1}{8}$ gramme of hydrogen or $\frac{1}{8}$ (34,460) = 4313 calories. The anti-calorific influence of a unit of oxygen in forming CO_2 or CO is, therefore, approximately either 70 per cent., or 43 per cent., respectively, of its influence when forming water.

In a paper read before the Geological Society of Washington, David White has recently called attention to the uniform anti-calorific value of oxygen in coal, and has based partly on this factor a scheme for the classification of coals. He states that the negative value of 1 per cent. of oxygen in "ordinary bituminous coals" is probably 70 to 80 calories, or "about twice as great as has been supposed." It is not clear to what supposition he refers; for Dulong's calculation assigns a negative value to 1 per cent. oxygen of $\frac{1}{8} \times 1$ per cent. of 34,460, or 43 calories *plus* the diluent effect of 1 per cent. of the coal, or approximately 65 calories, making a total of 108 calories, 50 per cent. greater than the value which White finds from experimental results. This excessive anti-calorific value for oxygen in Dulong's method we propose to

explain in some degree by the distribution of oxygen between carbon and hydrogen as set forth above.

If we calculate the heat value of an Illinois coal and of a Wyoming coal by Dulong's formula and by formulas based on the distribution of oxygen between H_2O, CO, and CO_2, according to our experimental results, the following values are found:—

Composition (Water Free):

	Illinois Coal.	Wyoming Coal.
Ash	6·16	5·56
Carbon	76·96	68·90
Hydrogen	4·49	4·56
Nitrogen	1·52	1·51
Sulphur	0·52	0·51
Oxygen	10·35	18·96

Calorific Value—Calories:

Dulong's calculation	7322	6333
Modified calculation	7453	6524
Determined	7536	6582

The formulas used for the modified calculation are the following:—

Illinois Type: W. (calorific value) = 8080 (C − 0·1200 × O) + 34,460 (H − 0·063 × O) + 2250 S.

Wyoming Type: W. (calorific value) = 8080 (C − 0·182 × O) + 34,460 (H − 0·050 × O) + 2250 S.

Summary.

1. It is shown that some coals liberate gas during storage, of a composition similar to that of natural gas, and that some coals rapidly absorb oxygen from the air during storage without forming carbon dioxide.

2. During drying in air at 105° C. some coals lose appreciable amounts of carbon dioxide, and most coals take up oxygen to a considerable extent; but none of those tested showed any considerable formation of combustible gases.

3. The nature of the volatile products distilled from several coals at low temperatures in the early stages of heating is shown to vary in different coals in accordance with their smoke-producing tendencies.

4. It is shown experimentally that the volatile matter of coal comprises a considerable proportion of non-combustible matter, varying with the type of coal.

5. The temperature in the coal during an official volatile determination was measured, and the composition of the official volatile matter determined.

6. A modification is suggested of Dulong's heat value calculation for coal based on experimental results showing the distribution of oxygen between hydrogen and carbon.

DESTRUCTIVE DISTILLATION OF COAL AT LOW TEMPERATURES.

By Professor A. H. White and Messrs. F. E. Park and W. A. Dunkley.

[A Paper prepared for the Michigan Gas Association.]

When coal is charged into a gas-retort, although the hot walls of the retort may quickly raise the outer layers of coal to a red heat, it is certain that the inner portions of the charge will be heated slowly—not only because the transfer of heat through the porous coke is slow, but because the heat absorbed in the decomposition of the coal also checks a rise of temperature. The almost steady yield of gas during the first two-thirds of the distillation period indicates that the temperature of the centre of the charge has not reached its best working temperature until after the middle of the run, or, roughly, until after two hours. The progressive change in the composition of the gas in the latter portion of the heat is to be laid largely to secondary reactions caused by the filtration of the gas from the cooler centre through the hotter coke on the outside of the charge. If the assumption be correct, that some considerable change in the composition of the coal in the retort takes place at a temperature well below a red heat, a knowledge of the products of these primary reactions at low temperature should aid in our study of the more complicated process of commercial gas manufacture.

A study of this sort might also throw some light on the problem of the differences between the coking bituminous and the non-coking bituminous coals. Our coals are derived from the decomposition of vegetable matter. It is believed that this vegetable matter accumulating under water in swamps underwent a marked preliminary change through the agency of bacteria; the resulting peaty product being poorer in oxygen and hydrogen, and richer in carbon, than the original vegetable tissue. Possibly the question as to whether the future coal was to be coking or non-coking was decided at this early stage by the differences in nature and extent of bacterial action, and the extent to which the myriads of jelly-like bacteria contributed their bodies to swell the mass of growing coal. In any case, however, a dense coal could only be obtained from this mass if it became covered with thick layers of earthy matter, which, by their weight, solidified the mass. The more powerful earth-thrusts as the land rose or fell must have caused greater pressures, with resultant rise of temperature—bringing about a slow destructive distillation of the coal, gases relatively rich in oxygen being evolved, and the resultant coal remaining richer in carbon and poorer in hydrogen and oxygen. The coals which are geologically older, and have been longer exposed to this metamorphic action, are usually, as might be expected, lower in volatile matter. Thus the coking coals of Pennsylvania are intermediate in their age between the anthracites and the poor coking coals of Michigan and Illinois.

M. Sainte-Claire Deville, the eminent French chemist who has been for more than a generation Consulting Chemist of the Paris Gas Company, has, as a result of nearly 2000 tests, conducted at the experimental works of the Company, divided coals into groups according to the relations of their percentages of oxygen to hydrogen; and he holds that all coking coals contain a percentage of oxygen approximately twice that of the hydrogen. Sainte-Claire Deville's generalization has been quite widely accepted, and in general holds true for the coals of this country. The good coking coals have about twice as much oxygen as hydrogen, the semi-bituminous steam coals have relatively less oxygen, and the weak coking coals of Michigan and Illinois have more oxygen than the coking coals.

If the change from decomposed vegetable tissue, through the various grades of bituminous coal to anthracite, has been caused mainly by pressure and the long-continued application of gentle heat without access of air—the difference between the coals from Illinois and Pennsylvania being merely that the change in those from Pennsylvania is more complete—it would seem that possibly the artificial application of heat which gives as its first product water and other compounds rich in oxygen, would lower the relatively high oxygen of the non-coking coals, and possibly bring them into the coking class.

These two lines of reasoning prompted the laboratory experiments which are partially presented in this paper. At the time when they were started, three years ago, the field was practically untouched. Within the last two years, however, several investigators have been working along somewhat similar lines. The much-discussed coalite is a bituminous coal changed by just such a slow heating to a maximum temperature of 800° Fahr. (425° C.); and the interest aroused by coalite may cause these experiments to be followed with more interest than they otherwise would be. E. Börnstein * has published the results of tests on eight German coals with results in general similar to those reported here; while in this country Professor Parr, Dr. Porter, and Mr. Ovitz, of the United States Geological Survey, have been working in at least related fields, although their work has not yet been published, and the results are known to us only in barest outline. Apparently we have all been attacking the problem from different view-points, and our experiences overlap but slightly.

Experimental Method.

Our low temperature distillations were carried on in the following manner: A sample of from 50 to 70 grammes of dried coal, ground to pass a 12-mesh sieve, was placed in a hard glass tube closed at one end. This was slipped into a heavy metal jacket intended to promote uniformity of temperature and placed in a combustion furnace. At the front end of the tube was a pressure-gauge followed by an absorption-train to remove water and carbon dioxide, and a graduated gasholder. Before starting a distillation, the greater part of the air in the train was pumped out, so that it should not react with the heated coal or gases. The liquid products of distillation were collected and measured; but their small amount precluded any quantitative examination of them. The change in the properties of the coal after heating were noted, also the amount and composition of the gases evolved. This examination of the gases caused considerable difficulty, on account of the simultaneous presence of hydrogen, methane, and ethane. The method of Jaeger for the fractional combustion of the hydrogen and hydrocarbons by copper oxide failed to give satisfaction with these gases, as it was found almost impossible to get complete combustion; there being always a large residue of apparent nitrogen. Experiments with synthetic ethane showed that the difficulty apparently lay in the combustion of that gas. Satisfactory results were finally obtained by using Campbell's method for the removal of hydrogen by a hot solution of palladium chloride, followed by Dennis and Hopkins's method for the combustion of the hydrocarbons. The following five widely different varieties of coal were tested:

Name.	Nature.
1. Zeigler, Illinois	Non-coking.
2. Cambridge, Ohio	Semi-coking.
3. Cannel	Feebly coking.
4. Pittsburgh gas coal	Coking.
5. Bay City (Michigan)	Coking.

Tests on Zeigler Coal.

The coal was furnished us by the United States Geological Survey as being the only Illinois coal which they had been utterly unable to coke at their coal-testing plant at St. Louis, and as

* See "Journal" for Sept. 25, 1906, pp. 836-40.

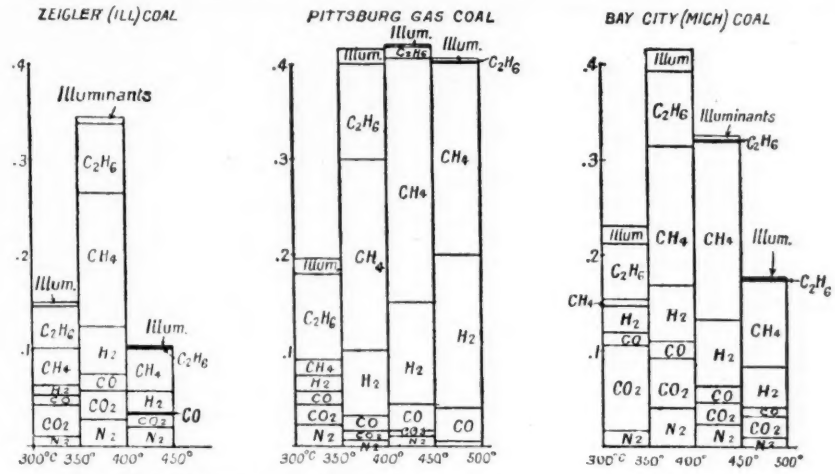


Fig. 1.—Yield of Gases Distilled from Coals at Low Temperatures—Cubic Feet per Pound.

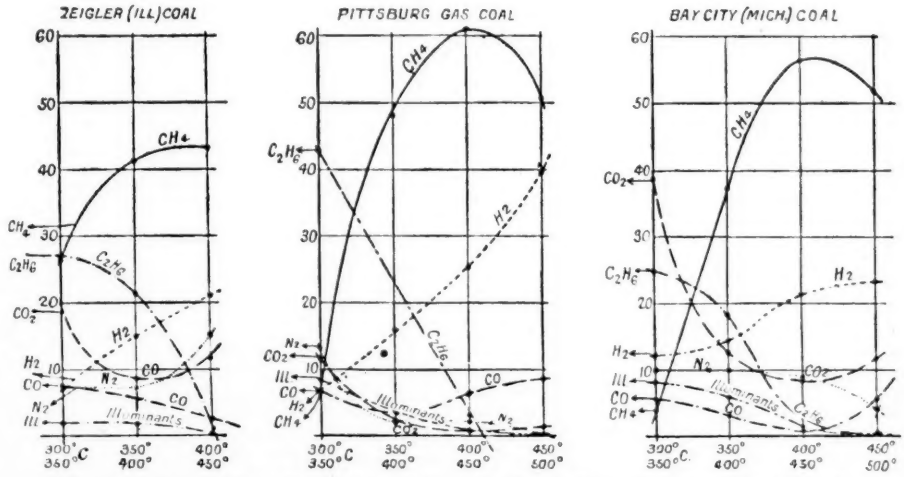


Fig. 2.—Analyses of Gases Distilled from Coals at Low Temperatures—Percentage of Constituents.

being one which had a ratio of oxygen to hydrogen higher than the 2 to 1 ratio usually presented in coking coals. The average composition of a carload sample was given by the Survey as follows:—

Proximate Analysis.	Per Cent.
Volatile combustible	29·86
Moisture	10·72
Fixed carbon	50·06
Ash	9·36
Ultimate Analysis.	
Ash	9·36
Sulphur	0·91
Hydrogen	5·30
Carbon	66·74
Nitrogen	1·40
Oxygen	16·29

The coal contained, therefore, more than three times as much oxygen as hydrogen, and seemed a desirable one to test. The experiments are described in the order of the test temperatures.

100° C.—To try the effect of long heating at a relatively low temperature, a sample of Zeigler coal, hermetically sealed in a glass tube, was heated in a steam oven for over a year. At the end of the period, it was opened carefully under mercury to collect the gas. Contrary to expectation, however, instead of gas rushing out, the mercury was sucked into the tube. There had certainly been no gas evolution due to destructive distillation. The diminution in volume was probably caused by absorption of the oxygen from the air of the vessel—the coal gaining in weight. Direct tests made by heating this coal in air at a somewhat higher temperature, 135° to 140° C., for four hours, showed a gain in the weight of the coal of 1·8 per cent.* Further heating for four hours, to 200° to 220° C., caused a further gain of 0·8 per cent. Further heating in the presence of air for six hours at 250° to 270°, however, caused a diminution in weight of 7·5 per cent., showing that marked decomposition had commenced at these temperatures.

200° to 300° C.—The distillations conducted at 200°, 250°, and 300° showed such marked similarity in results that they may be treated together. Each distillation lasted from one-and-a-half to three hours; and the chief product was an acid, watery liquid, containing some oily tar at the higher temperature. The amount of this watery fraction, as the mean of three sets of experiments, was 2·5 per cent. for 200°, 1·3 per cent. for 250°, and 1·5 per cent. for 300°. The change in the composition of the coal will be treated separately.

300° to 450° C.—The temperature interval 300° to 350° is a critical one. Soon after 300° a more rapid evolution of gas commences, and continues at an increasing rate. The amount of liquid products reaches a maximum in this fraction. Above 350°, it falls off. The yield of gas reaches its maximum in the succeeding 300° to 400° fraction and drops markedly in the 400° to 450° fraction. The variations in the yield and the composition of the gas for this interval are shown graphically in figs. 1 and 2, and will be discussed in connection with the other coals. The liquid distillates formed 16 per cent. of the weight of the coal. The change in composition of this coal is shown below—

	Volatile C.	Fixed C.	Ash.
Heated to 200° C.	36·8	54·8	8·3
,, 450° C.	30·6	59·1	10·3

The proximate analysis of the untreated coal showed a very feeble coke, crumbling under the slightest pressure. At each interval of 50° the tube was opened, the coal examined, and a small quantity removed for test of coking properties. Throughout the heating, the coal changed little in appearance, with no tendency of the fragments to fuse together. Through calculations from the composition of the products of distillation, it appears that the oxygen-hydrogen ratio reached the presumably desirable 2 to 1 ratio between the temperatures of 300° and 350°; but neither the coal withdrawn from the tube at these temperatures nor at any other showed any more tendency to coke than the original coal. On the contrary, the feeble coking property which the coal originally possessed disappeared as the heating progressed.

Tests on Cambridge Coal.

Duplicate tests on Cambridge (Ohio) coal showed the products of decomposition to be very similar to the Illinois coal, although the liquid distillates formed only 7·7 per cent. of the weight of the coal. There was very little decomposition below 300° C. Between 300° and 350° there was again a larger evolution of gas and liquid which had not completely ceased even after six hours' heating, with a decreased yield between 350° and 400°. Samples of coal were taken from the tube at the close of each heating, and

* The author mentions that a private communication from Professor Parr states that he has found that all coals commence an active oxidation when heated in air to 120° C.

tested for volatile matter and coking properties, with the following results:—

Temperature of Heating.	Percentage Volatile.	Character of Coke.
200°	40·8	Not very good.
250°	39·4	Not very good.
300°	32·9	Very weak.
350°	24·6	Crumbles when touched.
400°	19·1	Non-coherent dust.

The grains of coal did not frit together during the heating, but remained separate from each other, as when introduced into the tube. The coking properties of the unheated coal when heated to a red heat were none too good; but the heating caused the coking properties to deteriorate and finally to disappear altogether.

Tests on Cannel Coal.

This coal behaved as did the other two. The decomposition below 300° was very slight, and yielded almost exclusively watery products with a little tar. The heating at 300° was purposely prolonged more than fifteen hours, with the result that over 6 per cent. of liquid products was collected, but less than 0·2 per cent. by weight of gases—thus confirming the previous observation that the critical temperature for gas evolution lies somewhat above 300°.

The coal as received gave a weak coke. The particles did not cohere on heating up to 400° in our combustion tube; and the coal which had been thus treated had completely lost its coking powers and gave only a fine, dry dust on heating to redness. The proximate composition of the coal was as follows:—

	Volatile Carbon.	Fixed Carbon.	Ash.
Dried at 100°	45·7	41·1	13·2
After heating at 400°	22·0	57·0	21·0

Tests on Pittsburgh Gas Coal.

This coal gave even smaller amounts of distillation products than the others at the lower temperatures. The liquid products after heating for an hour-and-a-half at 200°, an hour-and-a-half at 250°, and two hours at 300°, were only 0·3 per cent. of the weight of the coal; while the gaseous products were negligible. The amount and the composition of the gases evolved above 300° are shown graphically in figs. 1 and 2, and will be discussed later.

The appearance of the coal when removed from the tube after heating to 450° C., was very different from that of the coals previously mentioned. They had come out of the combustion tube in loose grains, as they had been put in. This coking coal swelled and fused together in the tube, producing a firm and shiny coke, which was 72 per cent. of the weight of the original coal, and which came out in smooth cylinders. The change in composition of this coal on heating is shown below—

	Volatile Carbon.	Fixed Carbon.	Ash.
Dried at 100° C.	36·7	58·5	4·8
Heated to 450° C.	10·0	83·0	7·0

When one of these cylinders of coal which had been heated to 450° C. was placed in a crucible and heated to redness, it retained its shape and yielded a good coke. If, however, it was powdered and then heated to redness, it remained as dust in the crucible. As, with the other coals, the fusible coking element had been destroyed by heating to 450° C., it follows that, in the commercial manufacture of coke, although the oven may be at a bright red heat, the coal fuses together and the coke structure forms below a red heat.

Tests on Bay City Coal.

This coal (originally a fairly good coking coal) behaved much like the Pittsburgh gas coal. Scarcely any gaseous products were evolved below 300° C., and the amount of liquid was 30 per cent. of the weight of the coal—two-thirds being tar.

The composition and amount of gaseous products evolved above 300° C., are shown in figs. 1 and 2 and discussed later. Like the Pittsburgh coal, the coarsely ground material which was charged into the tube swelled and fritted together in the heating; so that it was removed as a strong coherent cylinder which retained its shape and strength on coking, but refused to coke if ground again to powder before heating to redness. The weight of the charge withdrawn from the tube was 64 per cent. of that charged; and the change in composition is given below—

	Dried at 100° C.	Heated to 500° C.
Volatile matter	49·5	19·0
Fixed carbon	46·1	73·0
Ash	5·2	8·0
Sulphur	3·6	2·7
Heating value, B.Th.U.	11,030	14,200

Composition of Gases Evolved.

As stated in the paragraphs describing the behaviour of the individual coals, the amount of gas evolved below 300° is negligible. Figs. 1 and 2 show graphically the amount of each constituent of the gases for the Zeigler, Pittsburgh, and Bay City coals, calculated in tenths of cubic feet of gas per pound of coal. It may be unwise to transfer our figures from the small laboratory experiments to these large scale units; but it is much easier to comprehend these units, and the secondary reactions are so much less important at these lower temperatures that the error is not as great as it would have been had we been working at the usual temperature of the gas-retort. The three coals yield gas very similar in composition.

The unusual constituent in this gas is ethane (C_2H_6), which is totally absent from coal gas, though it sometimes occurs in natural gas. As seen clearly in fig. 2, ethane forms from 25 to 40 per cent. of the gas evolved in the 300° to 350° interval; and its percentage diminishes quite regularly to a very small percentage in the 450° to 500° fraction. The hydrogen, on the other hand, starts with a small figure, and increases rapidly with the increasing temperature; while the methane (CH_4), also starting in small amount, increases more rapidly than the hydrogen till it reaches its maximum in the 400° to 450° interval. Between 450° and 500° it decreases both in amount and percentage. The unsaturated hydrocarbons—named illuminants in the charts—decrease with increasing temperature; starting at about 8 per cent. in the Pittsburgh and Michigan coals and decreasing to about zero at 500°. Of the oxygen compounds, carbon dioxide is, as was to be expected, higher in the Illinois and Michigan coals with their high oxygen content than in the Pittsburgh coal. In each case, it decreases for a time with increase in temperature; but in the case of the Illinois and Michigan coals, it increases again. Carbon monoxide is present in the first fraction to about the same amount as in illuminating gas, and gradually decreases.

If this were ever to be a commercial process, there would probably be no attempt made to separate the fractions. The data from the various fractions had been combined in the following table to show the total yield and average composition of the gas:—

The Average Yield and Composition of Gas from the Destructive Distillation of Coals when Heated for Six to Eight Hours at Temperatures of 300° to 450° or 500° C.

	Pittsburgh Coal.	Bay City Coal.	Zeigler Coal.
Volume of gas per pound of coal, cubic feet	1·42	1·15	0·63
Average composition of gas:			
CO_2	2·9	16·2	13·1
Illuminants	2·2	4·1	1·6
CO	6·2	5·0	5·8
H_2	26·3	16·4	13·9
CH_4	47·0	37·8	38·0
C_2H_6	13·2	11·8	19·5
N_2	2·7	9·1	7·8
Calculated heat value, B.Th.U. per cubic foot	902·0	778·0	871 0
Calculated heat value, assuming CO_2, eliminated	930·0	926·0	1001·0

The volume of the gas is small in every case as compared with the amount obtained from distillation in the usual gas-retorts; but the heating value of the gas from the Pittsburgh coal is better than natural gas, while that from the other coals, even with their higher carbon dioxide, is almost as good, and if the carbon dioxide should be removed would be of equal value.

The amount of gas was too small for candle power tests; and the composition of the gas is so different from that usually met with that an estimate of the candle power would be little more than a guess. It could certainly be superior to natural gas, and might rank with the average illuminating gas.

The composition of the gas in the 300° to 450° fractions, with its high methane, its ethane, and its low hydrogen, is in some respects more similar to natural gas than to coal gas. It has frequently been assumed that natural gas has been thus formed by destructive distillation, with later elimination of the unsaturated gases. Thus the ethane of natural gas has been assumed to have been formed by the direct addition of H_2 and C_2H_4, giving C_2H_6. We have here, however, ethane formed apparently as a primary product in a gas containing only small amounts of hydrogen and unsaturated hydrocarbons, which would favour the theory that the ethane in the natural gas is also a primary product. The fact that ethane is absent from the gas obtained at temperatures of 500° would tend to indicate that natural gas containing ethane had been evolved at temperatures somewhat below that point.

Discussion of Results.

These experiments, on slowly heating five American bituminous coals of widely differing classes to a temperature of 500° C. as a maximum, give results in general agreement with those obtained by other investigators, so far as others have previously covered the field. Coals which are originally non-coking are not improved in this respect, even though the ratio of oxygen to hydrogen in the coal may be brought to the supposedly favourable 2 to 1 ratio. The coking coals which were tested, sintered together during the heating; and if the resultant mass was heated to redness, it retained its shape and gave a good coke. If, however, it was powdered before the coking test, the powder stayed as such in the coking test. The coking constituent of the coal is evidently destroyed by heating to 500° C. The coal loses from one-third to one-quarter in weight during the process of heating to 500°; the resultant product being lower in volatile matter and, in the case of coals initially high in oxygen, higher in heating value than the original coal. The claims for coalite are confirmed to that extent.

The distillation products are mostly watery liquids with some light, oily tar. Gas evolution commences only above 300°, and the total amount is only about 1 to 1½ cubic feet per pound of coal; but it is of good quality. Ethane is an unusual constituent of the gas; and, together with methane, it forms the principal constituents of the gases evolved between 300° and 400° C. The ethane is almost entirely absent from the 450° to 500° fractions. It is suggested that this is an indication that natural gas in which

ethane is present has been formed at a lower temperature than 500° C.

So far as can be foretold from these small-scale tests, a process such as this could be a commercial success only under rather unusual conditions. It can hardly be successful as a method of manufacturing illuminating gas because of the low yield. There may be products of unusual value in the liquid distillates; but it is not known that such is the case. The resultant coal may sometimes have a higher and sometimes a lower heating value than the usual gas coke; but in the case of gas coals the yield of modified coal by this process is apparently not much greater than the usual yield of coke, and it would not seem that the process could be commercially successful as one for making prepared fuel. A possible promising field of limited extent may be indicated by the sintering together of fine particles of coking coals at this low temperature. It may be possible in this way to briquette fine coking coal and make a marketable article out of a waste one.

Consideration of the bearing of these experiments on the theory of the manufacture of illuminating gas from coal in the usual manner, indicates that the secondary reactions which take place in the gas-retort are perhaps more important than the primary ones. The products evolved from the coal at a relatively low temperature are subjected to reacting forces of increasing intensity as they filter through hot coke or come in contact with the hot walls of the retort. The product we desire is an intermediate one. Too vigorous a secondary action gives a poor product; too weak a secondary action allows too much of the liquid product to slip through undecomposed, and cuts down the yield of gas. The horizontal retorts tend to cause too great a secondary reaction as the gas sweeps through the narrow space under the hot crown of the retort. Vertical retorts (with the gas preferably passing up through the still unchanged and cool charge in the centre of the retort) should avoid this difficulty; but there is the theoretical danger that they might tend toward the other horn of the dilemma, and give too weak a secondary distillation.

The results are interesting and suggest many additional experiments which we hope may be carried out at some future day.

NEW BUSINESS METHODS IN GAS SUPPLY.

As mentioned in the notice of the recent annual meeting of the Michigan Gas Association which appears in another part of the "JOURNAL," a paper dealing with the new business methods in gas supply now in vogue in the United States was read by Mr. CLARK R. GRAVES. The following are extracts from the paper.

There is no more important division of a gas company's organization than the "new business" department—in fact, this is becoming recognized more and more every day. How many times we hear a customer say: "If I wanted gas I know where to get it without your calling." These people are just the ones the "solicitor" wants to see; for they otherwise would not be familiar with the many advantages of gas over other kinds of fuel and light, and might drift to the competitor's office.

With a well-established and advertised new business department, a representative has no trouble in being welcomed into the best of places, from the large manufacturer's office to the small dwelling parlour. That gas will sell itself is all right in theory, but not profitable in revenue gains. The progressive company of to-day classes itself as a commercial house; and commercial houses do not sell their goods without good salesmen and good advertising. The statement that "an article will sell itself" has been tried and proved a failure. The new business department of a gas company is no more than what a sales department is to a manufacturer or retail store; and where is the successful firm that has no salesmen, and does not believe in advertising?

The new business department of a gas company can be an overwhelming success or a total failure. The first essential to be successful is in the selection of a good manager, who must be a natural born or a self-made salesman—a man capable of handling salesmen, and of inspiring them with enthusiasm and a liking for their work, so that they can talk gas with heart and soul. This confidence instilled in the representative, as well as in the article he sells, makes his sales successful and satisfactory to the house and to the customer. The sales manager must be able to select a salesman and not a canvasser. A salesman proper is a man who has ability to exchange his goods for currency with a net profit for the company he represents. This kind of men are dear, but are the cheapest in the end; and the gas company can afford to hire such men with a good manager at the wheel, full of good judgment, for upon such men he can rely to bring in good business and good appliance accounts at a net profit.

In organizing a new business department, the point to work to in making it a success is maintaining it on a self-supporting basis. Every representative selling appliances should show on his sales a net profit to cover his salary and part of the general expenses of the department as well. A meeting-room for representatives, with everything available for creating interest and harmony, and magazines pertaining to gas education, and the establishing of morning meetings—reporting at such time the business closed and how it was done, and business not closed and why it was not done—all add to the effectiveness of working hand in hand individually and as a whole.

A salesman of high standard, with a record for good orders for some commercial house, has been a total failure at selling gas; whereas boys direct from school have made phenomenal successes. It is all in the representative himself. He must be alert, wide awake, and a quick thinker—one capable of using his eyes, ears, and mouth for the purpose for which they were intended, and able to judge a prospect when he sees it. A salesman selling dry goods knows the dry goods store is a prospect for his line; the hardware salesman, the hardware store. But the gas salesman's customer is anyone, anywhere, all the time. To the gas salesman, the least tempting prospect may prove the best revenue customer. The salesman who can distinguish good from bad is the one who works along the lines of least resistance. There are good talkers who are poor closers; in other words, a great many sales of gas are made but never recorded merely through the inability of the salesman to know when to use the "sign here" argument.

In order to be successful, make good use of the hours both night and day. The gas solicitor should aim to make every transaction a satisfactory one from the consumer's point of view; to make courtesy, accommodation, and integrity the height of his ambition, and afford all the same consideration; to constantly try to assist the company in improving its method and system; and to remember "Persistency" and "Everlastingly at it."

In the present age, with the competition of electricity and other artificial illuminants, gas companies cannot afford to sell an appliance they know is not adapted for the purpose for which it is purchased. Square, honest dealings by the representative and his company are powerful revenue getters. The representative cannot call too many times on his customers. Maybe, through neglect, the customer had decided to try another kind of light, and a call in time, a smile, or a good word, was all the tonic needed to keep him a satisfied customer. One important duty for the representative is to see that new buildings are piped. We must keep in touch with the architects, and impress upon them the value of piping and its small cost.

Mr. Graves went on to deal with the use of gas for lighting purposes. On this subject he said: The illuminating field may be divided into home lighting, commercial lighting, and factory lighting. From the earliest period of the gas industry, domestic lighting has been the important factor. The mantle burner is not a recent invention, but the expense of equipping a house with it, compared with open jets, has been high. This fact has been taken advantage of by manufacturers to place on the market burners of low standard, at a price so cheap that everybody could afford to buy. This has done the gas industry untold harm. Nothing so disgusts a consumer as the constant breakage of mantles and glassware; and as most cheap burners have no adjustment to regulate the supply of gas, is it any wonder that, after two or three unsuccessful attempts to get good service out of a burner, it is thrown away, and the consumer returns to open jets, or discontinues the use of gas for lighting altogether—this is to say, providing he is not shown the error of his ways and induced to try a good burner. For the users of gas through the open jet or cheap burners, the good inverted light tends to reduce the revenue to the company; but the results are altogether gratifying. A system of home insurance is profitable to the gas company and a convenience to the public.

As to commercial lighting, when you have induced a merchant to use gas for lighting, you have just commenced to sell him, and have sold him only when he has signed an order to pay for the appliance. The salesman who can get to his customer in the easiest and quickest way, who can make every word he says a word of accomplishment towards the selling-point, who will not take "no" for an answer, and only leaves the customer to return the next day stronger and better satisfied that he has something the customer wants, who learns from his daily experience what to forget and what not to forget, and digests the latter with his brain, and stores it away for the next day's work—this is the man who wins. It is that bull-dog grip of determination, coupled with courteous manner, that sells commercial gas to-day. Remember the gas salesman selling commercial gas deals, as a rule, with the proprietor himself—the man who pays the bill and the man who knows; so it behoves him to be wide awake, and to be able to deal with the careful, considering, and cautious merchant.

With reference to factory lighting, the average revenue has been proved to be less than the commercial revenue; but a lot of good factory lighting runs into a great many cubic feet of gas that would not be used otherwise. Where there are a hundred employees working under good light, approved by their employer, it is a pretty good assurance that the hundred families will all light their homes with gas. Some of the best factory lighting has been secured from the factories using their own lighting plants, by installing one or two arcs in the office or the shipping-room for after-hours, or one or two here and there for emergency use. But through their good features and the gradual giving out of the dynamo, the factory soon becomes lighted throughout with gas "arc" lamps.

Passing on to the subject of fuel gas, Mr. Graves said: Fuel gas is divided into domestic and industrial. It would not be overestimating in stating that ninety out of every hundred persons cooking with gas would not give it up for any other kind of fuel. Saying and doing are two different things. Housewives sometimes believe they could do without gas fuel; but a few trials of the old hot coal-range or the dirty, offensive oil-stove would thoroughly convince them of the value of the gas-range as a labour saver.

Thus the gas companies of to-day and of the future may plan extensive campaigns in the interest of domestic fuel revenue with no fear of a backward step of the consumer to coal, wood, or oil. This valuable necessity (domestic fuel gas) makes it possible for any company of push and progressiveness to secure net results; and, furthermore, gas companies heretofore not on a paying basis have been brought to a high standard through the valuable return from domestic fuel gas.

The cost of working a gas-range lies wholly within the operator's control. A good range will consume, through a regular top burner, 15 cubic feet of gas per hour; a giant burner (double burner), 22 cubic feet; the simmering burner, 6 to 8 cubic feet; and the oven burner, 35 cubic feet. Care should be taken to use the right burner for the right work, which will assist wonderfully in a saving. The domestic gas-range fuel bill is 2½c. per meal. It is worth this to build one fire, to say nothing of buying fuel, carrying it in, emptying ashes, and paying for stove repairs.

The domestic gas-range is no longer a summer luxury, but a 365-day necessity. This valued feature has been brought about in the last few years by the introduction of the coke-heater, which may be attached to any gas-range. With its simplicity and compact construction, it can be installed in almost any kitchen; and it affords a winning argument in inducing the consumer to use the gas-range all the year round. It is convenient for burning paper and other waste that accumulates; and, being especially constructed for the burning of coke, it affords a golden opportunity for the gas companies to dispose of this fuel as well. This heater is inexpensive and most economical to operate. It is rapidly replacing the necessity of a coal-range for cold weather. A representative, in soliciting for domestic gas-range business, should always aim at selling his customer a good range, and one he knows will warrant his returning; for a well-pleased woman is a good advertisement.

The hotel and restaurant fuel-gas department is fast becoming valuable, especially with the larger companies. The fact that hotels, clubs, and the modern restaurants are usually centrally located, and generally on lines of mains, gives us an opportunity of increasing revenue without expenditure for the extension of service or mains. The value of this department has been fully demonstrated in Detroit, where it is estimated that $20,000 worth of hotel appliances have been installed by the Detroit City Gas Company alone—showing a large increase of sales. The question might arise, How is it secured, and how is it held? First of all, the hotel man wants good service to his patrons, so he must have the best service in his kitchen, which is obtainable with gas appliances only. Secondly, to have these appliances give him the required service, it means a capable hotel maintenance man to keep the installations up to standard, and to this we attribute our success in keeping our installations in continuous use. Thirdly, on having an experienced hotel appliance salesman—one acquainted with the appliance best adapted for the purpose. With a good maintenance man, business may be obtained and kept. One of the selling arguments in the hotel appliance line is the saving of space—a valuable point to the hotel or restaurant keeper, who sometimes feeds hundreds from a kitchen smaller than the one at home necessary to feed six. As much work can be accomplished on a 2½-feet section of gas-range as on a 4-feet section of coal range; and there are besides the saving of labour, doing away with the man to build and care for fires, the saving of time, better service, better satisfied help, a more sanitary kitchen, and the saving of repairs.

The Heating Value of "Coalexld."

The value of "Coalexld" as a fuel for domestic purposes seems now to have been fully proved, as we learn that since the recent practical demonstration at Morecambe, to which reference was made last week, the result anticipated by Mr. Blakey, who has adopted Mr. Jowett's process at the gas-works, has been fully realized, and he is now running the whole of his plant in the production of "Coalexld," which is being cleared daily as it is drawn from the retorts. This is a much pleasanter state of things than having to stack the coke, at a cost for stacking and subsequent removal—to say nothing of the waste, depreciation in quality, and loss which occur when it has to be disposed of in other districts at a lower figure than that usually obtained at home. We are informed that the price now being paid for "Coalexld" leaves a very substantial profit compared with that realized for ordinary gas coke; and that every post brings inquiries and orders from gas engineers, who seem to be recognizing the advantage afforded them of being able to clear their yards of coke locally, and of not having to "dump" it upon their neighbours. The proprietor of a restaurant in Morecambe has given the fuel a fair trial in a continuous brick oven, and says he should be sorry to revert to ordinary coke, as better results, as regards heat produced, absence of sulphur and smoke, and small quantity of clinker, are realized with "Coalexld." The proprietor of a bakery in the town also testifies to the cleanliness and economy of the new fuel, for which there appears to be a good future.

The Devonport Gas Engineership.—The Gas Committee of the Devonport Corporation have received 63 applications for the position of Engineer and Manager, rendered vacant by the resignation of Mr. Joseph W. Buckley; and have selected five, who will be invited to meet them next Saturday.

REGISTER OF PATENTS.

Suction Gas-Producers.

BOWMER, J. J., of Newcastle-on-Tyne.

No. 21,682; Oct. 1, 1907.

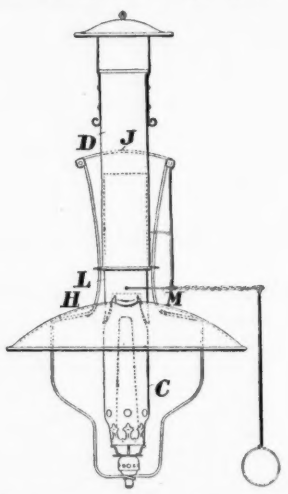
This is an improvement on apparatus described in three patents taken out by the present inventor in 1905—viz., Nos. 21,405, 22,046, and 22,382—and the modification now suggested consists in dispensing with the usual boiler and steam supply pipe, and in taking directly to the fuel steam generated from the water in the water-seal by the heat of the fire, and in taking air (preparatorily heated in an air-heater) to the fuel through the grate, so that the air and steam do not mix till they meet in the fire. The arrangement of grate inclines upwardly and away from the fire, so as to leave a space available for clinkering between the top of the grating and the top of the grate chamber.

Incandescent Gas-Fittings.

BLAKEY, J. W., of Bradford.

No. 21,691; Oct. 1, 1907.

The object of this invention is to dispense with the supplying of the gas to burners under pressure, and to obtain like effects with an ordinary incandescent burner by interposing between the glass chimney and the upper tube an intermediate chimney capable of being operated from the outside of the fitting by a lever, whereby the last-named chimney is raised for lighting and cleaning purposes.



Blakey's Intensified Incandescent Lamp.

The illustration shows a complete incandescent fitting, fitted with the intermediate tube and means for operating it. The space between the glass chimney C and the upper chimney D is filled by a movable intermediate chimney L made of fireproof material. The lower end of the chimney L is provided with lugs or projections which form bearing-pieces for the chimney to rest upon the upper portion of the shade or reflector H. The intermediate chimney is made of such a diameter that it will readily fit and telescope into the upper chimney; and it is of such a length that it passes a sufficient distance within the lower end of the upper chimney, and yet (when it is raised for lighting and cleaning purposes) it will not come in contact with the cross-bar J. The upper end of the chimney C is made to pass a sufficient distance within the intermediate chimney, which is raised and lowered by means of a bifurcated lever M, the inner ends of which (turned at a right angle to its main portion) pass through holes provided for them in the periphery of the intermediate chimney.

Thus in the fitting three tubes are provided—namely, the glass chimney C, the intermediate tube L, and the upper tube D; and when in line with each other, they form a continuous chimney for conveying the products of combustion away from the burner and mantle. When the intermediate chimney is raised by the lever M for lighting or cleaning purposes, the lugs or projections shown form stops for preventing the lever raising the chimney too high; and when the chimney is in the position shown—that is, filling the space between the glass chimney C and the upper chimney D—the light "will be considerably intensified in brilliancy without the use of any gas-compressing apparatus."

Removing Tar from Gas-Washing Plant.

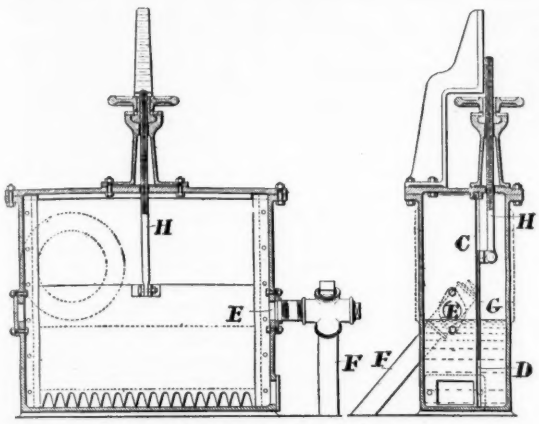
MASON'S GAS POWER COMPANY, LIMITED, WRIGHT, T., and HOLLIS, A., of Levenshulme, Manchester.

No. 21,693; Oct. 1, 1907.

This tar-removing box to be used in connection with the washing of producer or power gas (and in which is a water seal or trap for arresting the tar while allowing the gas to flow through) is so arranged that the depth of the seal may be readily varied without altering the box while it is at work, and also whereby, if desired, the flow of gas may be completely shut off.

The box is preferably rectangular in shape, as shown. It contains a partition plate C slightly nearer one side of the box than the other; and near its lower edge is an elongated orifice D, extending across the full width of the plate. An overflow outlet E connects the overflow pipe F. The top edge of the orifice D lies slightly below the overflow,

while the bottom edge lies a little above the floor of the box, or else extends to the bottom of the plate C. Alongside the plate is another, but narrower, plate G, which slidably fits grooves in the box, and is adapted to move up and down against the face of the plate C actuated by a rod H, which at its upper end is screw-threaded and attached to a hand-wheel.



Mason, Wright, and Hollis's Tar Remover.

With the box filled with water to the level of the overflow outlet, the top edge of the orifice D normally constitutes the minimum depth of seal. To increase the seal, the plate G is lowered until it partially covers the orifice—the depth of seal varying with the position of the plate. The lower edge of the plate is serrated, so as to cause the gas to be broken up into streams, and thus be "more effectually made free of tar."

Gas-Producers.

MASON'S GAS POWER COMPANY, LIMITED, and WRIGHT, T., of Levenshulme, Manchester.

No. 21,838; Oct. 3, 1907.

Patent No. 16,218 of 1906 described two or more producers arranged side by side and formed integral with each other, and in which the grate of each is set at an angle to a line drawn from centre to centre of the producers. The objects of the present improvements are: First, to provide a larger grate area than heretofore without increasing the distance between the wall of the producer and the sides of the grate; and, secondly, to supply two blowers, one at each end of the grate. A further object is to obtain these results "without interfering with the advantages obtained by the prior invention as regards resistance to bulging, and also as regards economy of floor-space."

Manufacturing Filaments for Illuminating and Heating Purposes.

LAKE, W. E.; a communication from GEORGES MICHAUD and EUGENE DELASSON, of Montreuil (Seine), France.

No. 22,036; Oct. 5, 1907.

This invention—another of the "Buisson-Hella" series—relates to apparatus for the continuous manufacture of filaments applicable for illuminating or heating by means of gas or its equivalents or by electricity in the atmosphere. The present application refers more particularly to the formation of the filament when it is intended to be energized by an electric current—not gas.

Subjecting Gases to the Action of Liquids.

PEAT, J. B., of Redcar, and BONIN, H., of Coatham.

No. 23,330; Oct. 22, 1907.

The object of this invention is to provide apparatus by which gases can be subjected to the action of liquids "with better effect than hitherto." The apparatus is especially intended for use in washing gases from blast furnaces and producers, before such gases are employed for generating motive power in gas-engines; but it can also be used for washing gases for burning in furnaces, or for other purposes.

The apparatus consists of a combination of compartments in communication with each other at their centres—the first compartment containing a rotatable disc and wheel to distribute water in a shower or film across the passage for the gases past the disc while a succeeding compartment contains (or succeeding compartments each contain) a rotatable wheel having therein zig-zag passages contracted at intervals. Means are provided for supplying water so as to wet the rotatable surfaces (or some of them) without having to drive them through a body of water. The washed gases are thus subjected to the combined action of change of velocity and change of direction, so as to separate the vapour, liquid, or moisture from the gases and allow the separated liquid to pass off.

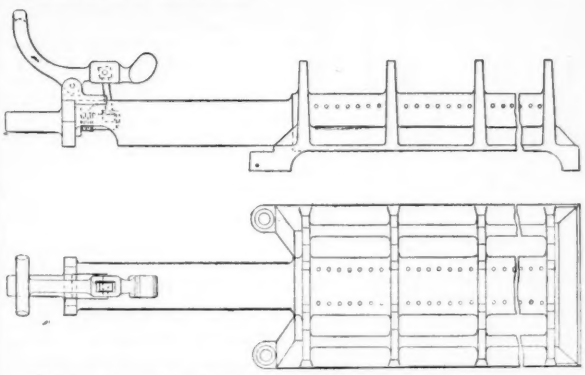
Automatically Controlling the Gas Supply to Stoves.

FLETCHER, RUSSELL, AND CO., LIMITED, NEIL, A., and FLETCHER, T. W., all of Warrington.

No. 23,458; Oct. 24, 1907.

This automatic gas "cut off" or regulator is specially applicable to soldering iron stoves or stoves of like construction; its object being to simplify the mechanism for enabling the gas to be automatically reduced to a glimmer each time the soldering iron or other article is removed from the stove.

As shown, the gas-inlet is inserted in one end of the tube in which the gas-jets are arranged; the gas-inlet consisting of a tube with a small hole in the inner end. A rod is passed vertically through the burner-tube immediately above the end of the inlet tube; and at the lower end of the rod there is fitted a flanged rest—the flange of the rest extending down so as to nearly cover the hole in the gas-inlet tube when the rod is down in the lowest position. The upper end of the rod is connected to a pivoted lever whose inner end is weighted, and the opposite end expanded so as to form a rest.



Fletcher, Russell, and Co.'s Automatic Controller for Gas-Stoves.

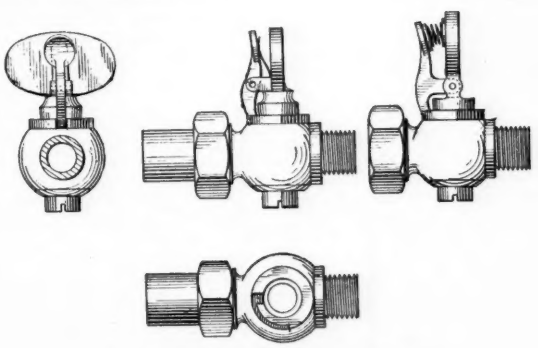
In this way, when (say) a soldering iron is placed over the burners, and the handle of the iron rests on the expanded end of the pivoted lever, the weight of the handle or the article itself overcomes the resistance of the balance-weight at the opposite end of the pivoted lever, and lifts the vertical rod attached to it, and with it the flanged rest connected to the bottom end of the rod. Thus the flange by which the hole is nearly covered is removed, and a full supply of gas passes to the jets. When the soldering iron has been removed, the balanced end of the pivoted lever falls down and causes the flange to come over the hole in the end of the inlet tube, thereby reducing the supply of gas to the burners to the quantity required for keeping a small flame only on the gas-burners.

Means for Locking Plug-Cocks.

WOODALL, H. W., of Lytchett Matravers, Dorset, and MOON, P. G. G., of Upper Parkstone.

No. 1124; Jan. 17, 1908.

This invention relates to a device for automatically locking a tap when it is turned off, "so that any chance of its being turned on accidentally is prevented."



Woodall and Moon's Locking Plug Cocks.

The plug of the tap is preferably extended through the casing or body as usual, and terminates in a spindle and headpiece. Upon these is mounted a lever, the bottom of which engages in a slot in the body of the cock when shut, and so prevents accidental opening. The top of the lever is spring controlled, so as to keep the bottom end in the notch. When the plug is to be operated, the pressure of the finger and thumb on the lever compresses the spring, frees the lower end of the lever from the slot, and allows the plug to be turned.

The invention, as applied to a plug tap, is illustrated in two forms so far as concerns the spring arrangement for keeping the lever in the slot in the body of the plug so as to lock the tap.

Gas-Burners for Illuminated Signs.

KELLEY, W. van D., of Newark, New Jersey, U.S.A.

No. 10,295; May 12, 1908. Date claimed under International Convention, June 3, 1907.

This invention has more particular reference to a thermostatically actuated gas-burner wherein the gas is automatically turned off and on in order to periodically illuminate a sign or other transparency, or where it is desired to periodically vary the heat or light derived from a gas-flame.

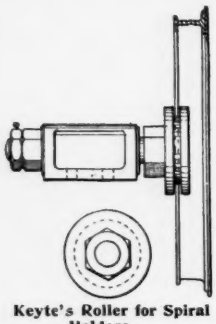
The inventor provides a gas-burner with a cock controlled by a thermostat in such manner that the contraction and expansion of the thermostat operates the cock to vary the flow of gas, and, consequently,

the light and heat given out by its burning. In combination with the thermostatically controlled cock is a magnetic or other retarding device, acting to prolong one or both of the periods, so that the gas-switch will not be actuated at too rapid a rate.

Guide-Wheels or Guide-Rollers for Spiral Holders.

KEYTE, G., of Workington.

No. 4572; Feb. 29, 1908.



Keyte's Roller for Spiral Holders.

When a guide wheel or roller of a spiral-guided gasholder is at rest, it is frequently desirable, of course, for purposes of lubrication and so on, to turn, or partially turn, it on its axis—an operation difficult in consequence of the resistance caused by the frictional contact of the wheel and the rail with which it engages.

According to the present invention, a portion of the wheel—such as the periphery of the boss or projecting centre—is formed with flat sides, giving it a hexagonal or octagonal form (for example), instead of the usual circular form. A spanner, key, or wrench can thus be readily applied to the boss, facilitating the rotation of the wheel.

Inverted Incandescent Gas-Burners.

DUNFHY, A. L., and TYSOE, J., of the East Greenwich Gas-Works.

No. 11,942; June 2, 1908.

This invention—a "Patent of Addition" to No. 20 of 1907—has for its special objects an improved construction and arrangement whereby the glass chimney or globe may be effectually locked, thereby preventing all "wobbling" or shaking of the chimney or globe, and the provision of a simple and efficient means whereby the placing of the globe in position may be effected. The earlier arrangement was described and illustrated in the "JOURNAL" for Nov. 26, 1907, p. 645.

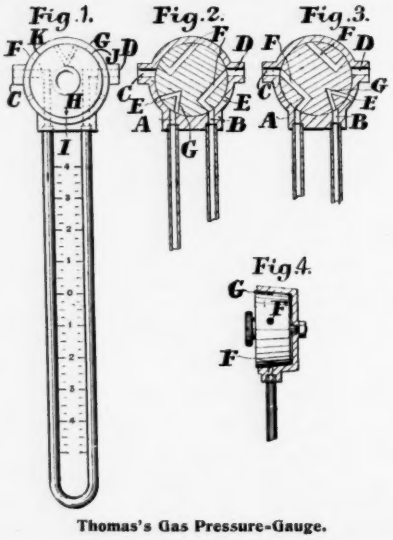
The modified burner consists of a tube, with a bend in it, of refractory material having a nozzle with lugs to receive the mantle and a back-flange to receive the chimney or globe, which is of spherical or other shape with an opening top and bottom and in its side for fixing to the back-flange. The underside of the bent tube is provided with a projection adapted to come into contact with the inner wall of the chimney or globe when being placed in position, and thereby prevent it coming into contact with the mantle.

Gas Pressure-Gauge.

THOMAS, W., of Vancouver, British Columbia.

No. 10,800; May 18, 1908.

This gas pressure-gauge is of the class wherein the difference in level of water in a U tube is used to determine the pressure of the gas admitted to the tube—there being a valve so arranged on the tube that gas from two different sources may be admitted to its opposite sides, so that the difference of pressure may be ascertained; or the gas from one or other source may be admitted to one side of the tube, while the opposite side is open to the atmosphere.



Thomas's Gas Pressure-Gauge.

Instead of connecting the upper ends of the U in the usual manner direct to the gas supply of which it is required to determine the pressure, they are, in the arrangement shown, connected to two ports A and B of a valve body bored slightly conical so as to receive a rotatable valve plug. On each side of the valve body are gas admission ports C D, at a distance from the ports A B, corresponding to the distance between them; and between these are small apertures E direct to the atmosphere. The rotatable valve plug is provided with two ports F, one on each side, which, when the valve is in the central position as shown in fig. 1, connects the gas admission ports C D to the ports A B. Between the upper ends of the ports F is a V port G, the distance between the ends of which corresponds to the distance between the ports A or B and their respective atmospheric apertures E on each side. The operation of the device is as follows: When the valve plug is turned to the position shown in fig. 1 with the indicating line H of the plug in line with the mark I of the body, the ports F of the plug will connect the inlet ports C D of the body with A B of the tube; and the gas which is admitted acts on the liquid within the tube and indicates on the scale the difference of pressure between the two sources of supply. If, again, the plug be turned to bring the indicating line H to the mark J as represented in fig. 2, the inlet D will be connected by one of the ports F to one side B of the U tube, while the port G will admit the atmospheric pressure from E to the other port A of the tube, and the gauge will indicate the gas pressure admitted at D. Similarly, when the indicating pointer, as in fig. 3, is turned to the mark K, the other inlet C will be connected to the other port A of the tube, and the atmosphere will be admitted through G to the opposite side through the port B. Thus practically three gauges are combined in one.

Gas-Meters.

HOWES, J. T., of Clapham Common, S.W.

No. 14,145; July 3, 1908.

This invention relates more particularly to means for securing the collapsible leather side walls of the measuring chambers of meters to the middle partition and to the metal diaphragms constituting the ends of the chambers.

Hitherto, this leather wall has generally been secured to the partition and to its diaphragm by its borders being passed over rigid rims soldered to the partition and the diaphragm and held thereon by a binding of wire; an alternative method being to secure the leather on the rim by a metallic strap or band passed around the border of the leather and tightened by a nut.

The present invention consists in securing the leather wall of the measuring chamber to the rim of a diaphragm or middle partition by a metallic strap, one end of which is secured to a block, while the other end is provided with a screw and is adapted to be drawn into the block by a nut—thus tightening the strap around the border of the leather wall and rim, the border of which is provided with a sheath for enclosing the strap and a shield which is interposed between the leather wall and the tightening device.

APPLICATIONS FOR LETTERS PATENT.

21,517.—PARKINSON STOVE COMPANY, LTD., and CHESHIRE, W., "Gas-fires." Oct. 12.
21,643.—GIBBONS, G. B. A., and MASTERS, E., "Regenerative furnaces." Oct. 13.
21,658.—THOMAS, A. C., "Mantles." Oct. 13.
21,660.—SCHIMMING, G., "Gas-generators." Oct. 13.
21,667.—MARTINI, A., "Suspending incandescent bodies." Oct. 13.
21,669.—LECOMTE, J. M., and ROY, M., "Incandescent burners." Oct. 13.
21,688.—BURSTALL, F. W., "Gas-engines." Oct. 14.
21,709.—BROCKWAY, F., "Mechanically clinkering retort-furnaces." Oct. 14.
21,729.—DANNERT, F., "Water-gas generators." Oct. 14.
21,731.—THIEL, A., "Tables with gas supply." Oct. 14.
21,734.—BARLEY, W., "Gas-iron stand." Oct. 14.
21,746.—MACKENZIE, J., MERCER, A., and METERS, LTD., "Prepayment gas-meters." Oct. 14.
21,763.—BURKHEISER, K., "Purifying gases generated by dry distillation or gasification, and obtaining bye-products therefrom." Oct. 14.
21,782.—BURSTALL, F. W., "Gas-engines." Oct. 15.
21,791.—THOMPSON, H. S., "Mantles." Oct. 15.
21,800.—GUTENSOHN, A., "Treating tar to recover certain light constituents and to facilitate subsequent distillation." Oct. 15.
21,824.—RIES, H., "Operating the doors of retorts." Oct. 15.
21,827.—KENT, W. G., "Meters." Oct. 15.
21,828.—TRAVERS, W. E., "Acetylene generator." Oct. 15.
21,887.—DOWN, H. L., and TELEPHOS, LTD., "Lighting and extinguishing gas." Oct. 16.
21,939.—HOYLE, H. P., and HEENAN AND FROUDE, LTD., "Coal conveyors." Oct. 16.
21,941.—CROSSLEY, W. J., "Internal combustion engines." Oct. 16.
21,961.—WARDLE, G., "Gas-burners." Oct. 17.
21,990.—HAWKINS, C. A., "Gas-turbines." Oct. 17.
21,997.—BURSTALL, F. W., "Gas-engines." Oct. 17.
22,004.—SYMONS, D. A., "Control of gas or other lamps." Oct. 17.
22,049.—ROBERTS, W. H., "Manufacture of illuminating gas." Oct. 19.
22,088.—KETTERER, F., "Prepayment gas-meters with differential wheel gear." Oct. 19.
22,090.—DAVIS, H. N., and TWIGG, W. R., "Gas-fires." Oct. 19.
22,207.—LENNOX, R. N., and FRASER, W. J., and CO., LTD., "Purification of gases." Oct. 20.
22,235.—BLOXAM, A. G., "Glass-carrier for inverted incandescent gas-lamps." A communication from Sparlicht G.m.b.H. Oct. 20.
22,243.—ESPENHAYN, W., and HUNGER, F. O., "Meter for liquids." Oct. 20.
22,381.—O'CONNOR, H., "Nipples for regulating the flow of gas to burners." Oct. 22.
22,387.—DOWSON, E. A., "Regenerative furnaces." Oct. 22.
22,401.—BÉRNARDY, E., "Igniting apparatus." Oct. 22.
22,423.—CLARK, W., "Coupling for pipes." A communication from Dellwik-Fleischer Wassergas G.m.b.H. Oct. 22.
22,477.—M'CARTHY, M. &. P., "Automatic closing valve for gas." Oct. 23.
22,482.—BARBOUR, J., "Pipe-joints." Oct. 23.
22,520.—HOYLAND, J. R., "Supporting mantles." Oct. 23.
22,621.—NEWALL, A., "Anti-vibrator. Oct. 24.

Messrs. J. & W. B. Smith, of No. 17, Farringdon Road, E.C., have been appointed wholesale agents for the Graetzin high-pressure inverted lamps.

CORRESPONDENCE.

[*We are not responsible for opinions expressed by Correspondents.*]

The Late Sir George Livesey.

SIR,—I have been reading with interest the correspondence in the recent issues of the "JOURNAL" in reference to the late Sir George Livesey, also Mr. H. E. Jones's remarks in his address to the London and Southern District Junior Gas Association, on "Labour."

To the end of the chapter, Sir George was a great thinker and worker. In my opinion, he had but two ideas in life—interest in his profession, and progress of religion with temperance reform. During the years of his residence in Reigate, I often had the pleasure of a walk with him; and during conversation, unless speaking of missionary work, or on some religious movement of the day, his whole life apparently was bound up in his profession. Nothing with regard to improvements in gas supply or lighting, however small, escaped his notice. He never seemed to tire of it; and to this may be attributed his success in life. Often have I tried to change the subject of conversation, and induce him to speak upon the other side of life—its pleasures and enjoyments—but never succeeded. It seemed to have no part or parcel with him.

He was of an even disposition, pleasant in conversation, but severely critical in his opinion of men he was likely to be brought in business contact with. If up to his standard, he was sure to improve their interests as occasion served. I never knew him but once to thoroughly lose his temper, and that was when speaking of the recent re-assessment of the gas-works, the threatened lawsuit to follow, and what caused it. He was serious once, just before his last illness. I met him in the town; and he asked me to go back home with him. On the way, I inquired after the Chief Engineer's health. He suddenly had a far-away, mysterious look on his face, and replied, "Yes; I think he is in good health, and do hope he will continue so." He, however, quickly regained his former self, and by the time we got to Reigate Heath he had just finished a warm debate upon the best form of hydraulic main and proper length of dip-pipe. He had no faith in the recent proposed alterations of its work. The simple life extending to engineering was his idea; and when we parted outside "Shagbrook," it never occurred to me that it was the last time I should ever be in his company or in conversation with him.

Since then I have often wondered, if he was at all conscious of his approaching illness, that such an apparently simple subject should end the life's conversation of such a man as he. If so, never did anyone more completely disguise the true state of his health. He was as active, vigorous, and full of business ideas as though only in the prime of life. Soon after, when hearing of his illness, I inquired at the house, Lady Livesey told me she thought his life's work was finished—he had "fought a good fight." I replied, "Very true—nobody more so;" but I said I hoped his fighting days were not yet ended. Her Ladyship, however, had no hope. The respect and esteem in which he was held by those who knew and worked with him, were shown by his funeral procession, which was fit for a monarch. He was worthy of it.

The future historian, looking through the roll of men famous in their day, will find the name of Sir George Livesey with a brilliant record. Reviewing his life-work, and what has lately been written of him, I think the exquisite lines, "Footprints on the sands of time," &c., may well be applied to his memory.

Reigate, Oct. 26, 1908. E. S. PIKE.

Unemployment.

SIR,—The problem of the unemployed has been before the notice of the public for some time, but more especially during the past week, through the prominence given to the subject both inside and outside the House of Commons. Whatever may be the shade of our political opinion, we must have read with interest the recent speeches of the President of the Local Government Board on this question. It is evident that much may be done by public bodies and others to find useful employment in these times of serious distress.

My object in writing, however, is to remind your readers, rather than to point out—for it is no new idea—that gas engineers, supported by their committees, may do much to assist contractors in the gas industries to give more regular employment to their workpeople, by placing their orders for new and additional plant more evenly over the entire year. The experience of most contractors is that the demand comes on with a rush, at a time when they are engaged upon renewal work and small contracts, when they are least able to cope with large additional orders without calling into being extra men and plant for the busy season, to be thrown idle when the rush is over.

Many prominent engineers do take the course suggested, and thus secure lower prices and save much anxiety and worry to themselves as to completion.

Is it too much, at this juncture, to ask that more will take into consideration this important matter, and get forward new work and place orders for same during the winter months, which will be a fourfold benefit to the industry—namely, less anxiety and better work for the engineers; reduced cost to the purchaser; regular employment of contractors' workmen and plant; and less worry and better results to contractors?

Keighley, Oct. 29, 1908. THOMAS S. CLAPHAM.

Riveting Services to Steel Mains.

SIR,—In reply to the letter of Messrs. J. Stone and Co. in your last issue, referring to my lecture to the Yorkshire Junior Gas Association, I should like to say that my criticism was directed to three points—the two (*a*) and (*b*) as reproduced in their letter, and a third to the effect that, in the case of the nipple becoming corroded and needing replacing, it still could not be screwed out of the main.

With regard to (*a*), it is obvious that if, after the riveting process has been carried out, the nipple is screwed up another half-thread, the effect would be to tighten the service into the main, in precisely the same way as if the nipple were not riveted at all. But at the same time the head of the rivet, as I may call it for want of a better term, upon the interior of the main, would be correspondingly loosened. (*b*) This is admitted in the fourth paragraph of Messrs. Stone and Co.'s letter. (*c*) It follows naturally that, if "when once the nipple is fixed it becomes part of the main," and cannot be removed, the proper remedy for a corroded nipple—namely, replacement—cannot be applied.

Your readers will be able to judge as to how far Messrs. Stone and Co.'s. letter meets the criticisms (*a*) and (*c*).

Leeds, Oct. 29, 1908. WALTER HOLE.

Metropolitan Water Board's Charges.

SIR,—The result of the Mansion House meeting yesterday was to protest influentially against the Water Board's extortion. But this had already been proclaimed from the housetops. Few of the speakers realized to the full that the true position of the ratepayers is just that of a man who has brought into the world a thriftless family which he is bound to support; except that the ratepayers cannot, like the unfortunate father, warn the tradespeople not to give credit. If everyone in London sank a well, the inhabitants would still have to pay the Board's exactions in the shape of a general rate.

There is one, and only one, course open to the consumers, and that is to bring about an investigation which will force the Board (1) to explain its present position and (2) give some security that for the future it will live within its means. All else is beating the air.

57, *Gracechurch Street, E.C., Oct.* 29, 1908. GEORGE KEBBELL.

Decreasing Average Income per Unit.—By an oversight, an editorial note was not appended to Mr. J. F. Tyndall's letter on the above subject in last week's issue. If he will refer again to our comments on his paper in the "JOURNAL" for Aug. 18, he will find these words: "We are as strong as Mr. Tyndall can be against *extremes* of differential prices, and especially such extremes as he points out, unless there is some abnormal justifying circumstance." In just the same way we are opposed to the unprofitable charges for electricity for power at West Ham; but we cannot yield to Mr. Tyndall or anyone else that reasonable differential prices should not be made in these competitive days.

LEGAL INTELLIGENCE.

THE SUPPLY OF LISTS OF SHAREHOLDERS.

High Court of Justice—Chancery Division.

(*Before Mr. Justice* WARRINGTON.)

On his Lordship taking his seat last Friday, the case of *Davies v. Gaslight and Coke Company* came before him.

Mr. LAVINGTON said he had to move the Court for a *mandamus*——

Mr. R. J. NEVILLE, who was instructed by Messrs. Monier-Williams, Robinson, and Milroy (interrupting), said he wished, before his friend went into the case, to cross-examine the plaintiff.

Justice WARRINGTON suggested that, if this were so, it would be better to arrange for a speedy trial of the action.

Mr. LAVINGTON agreed, if his Lordship would fix an early day. He said he did not know what his friend wanted to cross-examine for.

HIS LORDSHIP suggested that Counsel would find that out later.

Mr. LAVINGTON said the point was a very simple one—whether defendants were compelled to supply the plaintiff with a list of their shareholders. He did not think any pleadings were required, as this was the sole point. The plaintiff was a shareholder in the Company, and applied for a list, which the Company refused.

Justice WARRINGTON: Is it a question of law?

Mr. LAVINGTON said it was simply a question of the construction of the Act of Parliament.

It was then arranged that the action should be set down to be tried on the 3rd prox. with witnesses, but without pleadings.

Court House, Stratford.—Saturday, Oct. 31.

(*Before Col.* E. GARRETT, *Chairman, Mr.* MARK CHAPMAN, *Mr.* J. A. G. BODGE, *and Mr.* R. STROUD.)

Davies v. Smallbone.

To-day, at the Stratford Police Court, the Magistrates had before them an information laid by Mr. Hubert Percy Davies, of No. 38, Ormiston Road, Shepherd's Bush, W., who stated that Mr. Frederick Smallbone, Manager and Secretary to the Chigwell, Loughton, and Woodford Gas Company, on the 27th of August last unlawfully refused to give him (being a shareholder of the Company) a copy of the register of members, on being required by him so to do—he (Mr. Davies) then being ready to pay the sum legally demandable for the copy—and that the said refusal continued 36 days thereafter.

Mr. F. PHILLIPS (instructed by Messrs. Jones and Son, of Colchester) appeared for Mr. Davies; Mr. H. COURTHOPE-MUNROE (instructed by Messrs. R. W. Cooper and Sons) represented Mr. Smallbone.

When the case was called on,

Mr. PHILLIPS explained that personally he was ready to proceed;

but he had just been informed that Mr. Davies was not present, and could not be present, as he was down at St. Leonards ill.

The MAGISTRATE'S CLERK (Mr. W. J. Attwater): Is he a material witness?

Mr. PHILLIPS: I think he will be to this extent—that he is the shareholder who made a request for a copy of the list of members of the Company.

Mr. COURTHOPE-MUNROE: I do not think it will be necessary for the Bench to adjourn, because there is a preliminary point with regard to the jurisdiction of the Court.

The CLERK: Under what Act are the proceedings taken?

Mr. PHILLIPS: The right to examine the list of shareholders, or to receive a copy, is contained in section 10 of the Companies Clauses Act of 1845, which is incorporated in the Company's Private Act of 1873. This section provides that such a list is to be given.

The CLERK: Does the section provide a penalty?

Mr. PHILLIPS: I anticipate that will be my friend's objection.

The CLERK: Well, then, we had better hear the objection.

Mr. COURTHOPE-MUNROE remarked that this was an attempt to invoke or create a jurisdiction which, during the sixty years since the Act was passed, had never been invoked in any Petty Sessions Court in the country, in order to obviate the necessity of the application being made for the list of shareholders, as it should be made, if at all, to a Divisional Court of the High Court of Justice. Section 10 of the Act of 1845, which regulated this matter, enacted, in the interests of shareholders who desired *bonâ fide* for the purposes of the Company to know who their fellow-shareholders were, that every shareholder should be entitled to ask for a copy of the names and addresses of his brother shareholders—the intention being that they should have an opportunity of convening meetings and discussing matters of common concern. In the section, it said that a shareholder might inspect the register, and if he so wished obtain in the proper way the names and addresses of the shareholders; but there was no more. Now, where there was in an Act of Parliament a mere statutory requirement that certain things should be done, in the absence of any penalty being stated, the only Court that could do anything was a Divisional Court of the King's Bench, who, of course, had the power of seeing that the law, in proper cases, was carried out. The result was that the only way in which application could be made in this matter was by *mandamus* in the High Court to deliver to the applicant the names and addresses of shareholders. One could well understand—knowing the facts, as he did—why the application had been made to this Court, which had no jurisdiction, instead of going to the High Court. The High Court had held some fifty years ago that, although the terms of the Act were absolute, that a shareholder might require a copy of the names and addresses of the other shareholders, inasmuch as there was no power to get this except by going to them for a *mandamus* or an order which would result in imprisonment in case of default, they would not aid any person to enforce this provision, which was meant for *bonâ fide* shareholders, unless the applicant satisfied them that his motives were *bonâ fide*. In the present case, so far from it being *bonâ fide*, the whole point was that the application emanated from a gentleman named Mr. Davies, who he was not at all surprised to find was too ill to be present. He thought that, if the case was adjourned half-a-dozen times, they would still find that Mr. Davies was ill, because he (Mr. Courthope-Munroe) had a little material on which he should like to cross-examine him. The defendant Company concerned in the present matter was a most respectable one; and their action was being taken to prevent this section of the Act being utilized, not for the purpose of dealing with the affairs of this particular Company, but for the purpose of obtaining names and addresses of shareholders in good concerns and sending to them various circulars and prospectuses relating to "wild-cat" schemes. It was with this object that Mr. Davies had, in the case of various companies, purchased some £10 worth of stock. In the Company now concerned, he believed it was £50 worth; and the moment he got his certificate registered he wrote a letter, dated Aug. 5 last, in which he said he desired a copy of the names and addresses of the ordinary stockholders, and would be glad if same could be prepared for him. He enclosed 2s. 6d. deposit. This was his practice.

The CLERK: It is beside the point.

Mr. COURTHOPE-MUNROE: If the Court hold that they have jurisdiction, and Mr. Davies comes here, I have the "JOURNAL OF GAS LIGHTING," "Truth," "The Financial News," and a whole stock of other papers, all dealing with these companies in which Mr. Davies's name appears. It is clear that the whole thing is *mala fides*. Continuing, he remarked that the Court could only deal with matters entrusted to it under Statute. There were cases where Parliament had imposed a penalty, and the Court had said: "It is thus fair to assume that these are to be dealt with by summary jurisdiction." But for the last fifty and more years no attempt had ever been made in such a Court to enforce this particular section. Under the very same Act, in the case of the *Queen v. Directors of the London and St. Katharine's Dock Company* (44 L.J., Q.B. 4), in the year 1875, the Court of Queen's Bench held that, when a party came to the High Court, no matter what the rights were, if they were satisfied that the object was an injurious one, and not *bonâ fide*, they would refuse to aid it. So that even if the present Court had jurisdiction, he should ask them to take the same line, and say this was simply an attempt to get at the unsuspecting person—the clergyman, the widow, and so forth—and that they would not aid it. But the real thing was that the Court had no jurisdiction; and if his friend had the courage to meet him in the High Court, he would have much pleasure in dealing with the matter. There was a more recent case, in which the Bank of England declined to give particulars with regard to the owners of unclaimed stock. Here, again, the Court took the same line, and said that, though the terms of the Act were absolute, inasmuch as the person who came forward was simply doing it for the purposes of his business, if he could not secure what he wanted without their help, they would not aid him.

Mr. PHILLIPS said that in the whole course of his experience he had never heard a more remarkable speech in support of a technical objection than that of his friend. He had been using this opportunity to hang on to his statement something which formed no part of any argument in support of his objection. With regard to his point that the High Court, on an application for a *mandamus*, would have discretionary power if the application was an improper one, no doubt this was so. Supposing that the Court they were now before were of opinion that they had jurisdiction in this particular case, they would be in exactly the same position. If his friend supported his speech with evidence to show that the application was not a *bonâ fide* one, the Court would have the same power.

Mr. COURTHOPE-MUNROE: It is for you to show that it is *bonâ fide*.

Mr. PHILLIPS (continuing) said the short point was really the technical objection taken by his friend that there was no power to deal with the matter in that Court, because section 10 of the Companies Clauses Act of 1845 did not give it. The section merely provided that: "In addition to the register of shareholders, the Company shall provide a book, to be called the 'shareholders' address book,' in which the secretary shall from time to time enter in alphabetical order the corporate names and places of business of the several shareholders of the company, being corporations, and the surnames of the several other shareholders, with their respective christian names, places of abode, and descriptions, so far as the same shall be known to the company; and every shareholder, or if such shareholder be a corporation, the clerk or agent of such corporation, may at all convenient times peruse such book *gratis*, and may require a copy thereof or of any part thereof; and for every hundred words so required to be copied, the company may demand a sum not exceeding sixpence." There they had the statutory provision giving the shareholder the right to have a copy of this register. *Prima facie* the Statute ordered the thing to be done, and meant that the non-doing of it was to be met by some sort of punishment. In the case of the Companies Act of 1862, there was a special provision——

Mr. COURTHOPE-MUNROE: That does not apply to this Company.

Mr. PHILLIPS said that was so; but there was in that case a provision that if the list was not given, there was an offence, and the penalty might be recovered before the Justices. So that in the Act referred to there was the express provision that this could be done. In the Act of 1845, there was a general clause, in section 142, which provided, with respect to the recovery of damages: "In all cases where any damages, costs, or expenses are by this or the Special Act, or any Act incorporated therewith, directed to be paid, and the method of ascertaining the amount or enforcing the payment thereof is not provided for, such amount, in case of dispute, shall be ascertained and determined by two Justices; and if the amount so ascertained be not paid by the company or other party liable to pay the same within seven days after demand, the amount may be recovered by distress of the goods of the company or other party liable as aforesaid, and the Justices by whom the same shall have been ordered to be paid, or either of them, on application, shall issue their or his warrant accordingly." His submission was that if there was anything to be paid for non-performance of this section 10, the proper method of recovering whatever might be recovered was before the Court, as section 142 said that in all general cases application was to be made to Justices. He agreed there was this one defect, that there was no provision here for a penalty at all; and if it was to be said there was no punishment at all for the infringement of section 10—that, although the Statute had said "You shall give this list of shareholders," yet at the same time there was no punishment for a breach—then he could not go to that or any other Court for it, and the only remedy would be to go to the High Court for a *mandamus*. He accepted this; but to make it good, it had got to be said that a refusal to comply with the Statute was subject to no punishment at all. He relied on section 142 as saying that the Court he was now before was the Court that must inflict the penalties, or assess any damage, or things of that sort that had to be done; and the only thing that would prevent him being heard there, would be if the Court said that, although there was this duty to give the list, nevertheless a breach was subject to no penalty at all.

The CLERK: The Justices have no power.

The CHAIRMAN: We are of opinion that the objection taken on behalf of the Company is quite good.

Mr. COURTHOPE-MUNROE: I should like to say I have just heard that Mr. Davies is making an application to the High Court for a *mandamus* against the Gaslight and Coke Company; and he has been ordered to be cross-examined. I apply for costs, because Mr. Davies is fully aware this is only part of the general procedure. The Bench have discretion.

The CHAIRMAN: You must show that the Justices have power to give costs. There is nothing before them.

Mr. COURTHOPE-MUNROE: It is rather a game of "Heads I win, and tails you lose," for Mr. Davies to bring people to these Courts. Will the Bench say they will not prevent me making an application in the matter later on?

The CHAIRMAN: They will make no order, but simply dismiss the summons.

WATER SUPPLY TO A BOARDING SCHOOL.

Decision Adverse to the Bognor Water Company.

In the "JOURNAL" last week (p. 287), we reported the proceedings in an action brought by Mr. Richard Frederick, keeper of a boarding school, against the Bognor Water Company, to obtain a declaration that he was entitled to a supply of water at ordinary rates for "domestic" purposes, whereas the Company contended that the water was required for a "business." The question came before Mr. Justice Eve, in the Chancery Division of the High Court of Justice, on a special case stated for the opinion of the Court; and he delivered his considered judgment last Wednesday.

His LORDSHIP said the plaintiff was lessee for a term of years and occupier of a dwelling-house at Pagham, Bognor, within the area of supply of the defendant Company. He resided in the house with his family, and carried on a boarding school. There was also a building which he intended to use as a laundry in connection with the school, for which he required a supply of water. It was admitted for the purposes of the case that the plaintiff was using part of the house for a business; and the defendants admitted that the purposes for which

he contemplated using the water must be treated as "domestic." Section 60 of the Company's Act provided for charges at domestic rates; and section 61 specified that the Company should not be compelled to supply water otherwise than by agreement in the case of a dwelling-house, where any part was used for trade, manufacture, or business for which water was required. The defendants contended that under this section they were relieved from supplying the plaintiff with the water he required at the rates specified in the former section for domestic purposes, and that they were entitled to refuse to supply water unless and until an agreement was come to between them and the plaintiff as to the terms upon which water should be supplied. The plaintiff submitted that section 61 had no application to the case; and he claimed to be supplied under section 60. The determination of the question appeared to turn on the construction he placed on the words "for which water is required." The case of the *Chester Water-Works Company v. Guardians of the Chester Union** seemed to indicate that the construction of the words must depend on the purposes for which the water was actually used. On considering all the cases he (his Lordship) came to the conclusion that the keeping of a boarding school, though it involved the use of water for the purposes of the inmates, was not carrying on business for which water was required, within the meaning of section 61 of the Company's Act. He therefore made a declaration that the plaintiff was entitled to be supplied with water for his house and premises at a rate not exceeding the rates specified in section 60. He gave judgment in favour of the plaintiff for the amount he had overpaid in respect of the water supplied by the defendants, and ordered them to pay the costs of the action.

PROSECUTION OF UNION DES GAZ COMPANY'S OFFICIALS.

A trial was begun on the 14th ult., before the Tribunal of Milan, that is exciting great interest locally. It arises out of the asphyxiation by gas of two young girls, aged 10 and 16 respectively, daughters of Ing. Pietro Rotondi, on the night of Jan. 13-14, in his house in Corso Magenta, Milan. Workmen and officials of the Union des Gaz Company, who light Milan, are charged with criminal homicide—Raimondo Portaluppi, gas-meter inspector, with not having closed, through negligence and carelessness, on the morning of Jan. 13, the screw-tap of the syphon box of the gas-meter in the house, in consequence of which gas escaped, causing the death of the two girls; Ing. Augusto Cuffia, the Manager at Bovisa (Milan) Gas-Works, and Ercole Vegezzi, with having carelessly or contrary to orders sent out gas at excessively high pressure up to 70 mm. (2¾ inches) beyond the resistance of the water-seal of the meter; while Ing. Lacombe, the General Manager of the Union des Gaz Company in Italy, is being proceeded against as civilly responsible for the three others charged criminally. All were represented by Counsel.

The evidence showed that Portaluppi, on the day previous to the death of the two girls, had called as usual to put water in the meter. He remembered taking out the screw of the syphon to see if the gas blew, and putting it back again. It was found on the floor; and the gas escaped into the bedroom. Ing. Cuffia explained that the Bovisa works had started on Jan. 28 last, serving then only as a gasholder station, and receiving gas from the San Celso works after midnight through the ordinary mains of the city. The gas pressure was not more than normal.

At a subsequent hearing, Ing. Michelangelo Böhm, in January last Manager of the San Celso works, but now no longer with the Union des Gaz Company, was called as a witness. He explained the water-seal of the meter, and cited the Paris Gas-Works as sending out gas up to 180 mm. (7⅛ inches), reaching the burners at 65 to 70 mm. pressure. The slowing-down of the suction plant would indicate at once a rise of pressure; and these increases were always verified. Counsel for the prosecution intimated that it would be necessary to institute penal proceedings against the witness, Ing. Böhm, as responsible for the gas sent out from San Celso. After speeches by Counsel for the accused, the proceedings were adjourned to allow the necessary steps to be taken.

Convictions for Altering Time-Sheets.

At the County of London Sessions last Thursday, before Mr. Loveland-Loveland, K.C. (Deputy-Chairman), John Culling, a clerk, was indicted for conspiring with Robert Charles Tyler to obtain by false pretences different sums of money, the property of the Gaslight and Coke Company, and for making false entries in an automatic time register and in certain analysis sheets and work sheets belonging to his employers; and Robert Charles Tyler, 25, a gas-fitter, was indicted for conspiring with Culling, and for obtaining certain sums of money from the Company by false pretences. Culling pleaded "Guilty." Mr. Travers Humphreys and Mr. Edward Boyd appeared for the prosecution; Mr. Cassels defended Culling. Mr. Travers Humphreys said that Culling was a clerk and Tyler a fitter at the High Street, Kensington, district branch of the Company. Explaining the system adopted by the Company, Counsel said that each fitter when beginning work in the morning started an automatic time machine, which showed how long he worked. At the end of the day he put down on a time-sheet the number of hours he had worked, and this sheet was certified by a foreman and then passed on to Culling, whose business it was to make out a weekly analysis sheet. It was alleged by the prosecution that Culling and Tyler had conspired together that Culling should put down in Tyler's analysis sheets more hours than he had actually worked; and this necessitated altering the figures in the automatic time register sheets and the work sheets. It was further alleged that the two prisoners had agreed to share the excess money received by Tyler. Tyler denied that he had conspired with Culling. He said that when occasionally a mistake had been made and he had been overpaid, he had always handed the excess money back to Culling. The Jury found Tyler guilty. Culling was further charged on a similar indictment in connection with Augustine Edwin Beare, 26, a gas-fitter in the employ of the Company; and Beare was indicted for conspiring with Culling, who again pleaded "Guilty." The facts were similar to those in the former case. The Jury found Beare not guilty. Culling and Tyler, both of whom it was said had hitherto borne excellent characters, were sentenced—Culling to six and Tyler to four months' imprisonment in the second division.

* See "JOURNAL," Vol. XCVII., pp. 42, 229.

Sequel to a Fenton Gas Explosion.

At the Hanley County Court, last Thursday week, Mrs. Alice Spencer, of No. 184, Victoria Road, Fenton, sued the Fenton Urban District Council for £100, damages sustained by her in consequence of an escape of gas, owing, as she alleged, to a defective service pipe or main belonging to the Council, whereby an explosion occurred. The plaintiff's case was that in December last she went with a lighted match to a cupboard at her house, in order to obtain a letter. There was an explosion of gas, by which she was burnt about the face and neck, her hair was singed, and she suffered severely from the shock. In consequence of the trembling of her hands, she was still unable to pursue her employment. The defence was that, in order to succeed, the plaintiff must establish negligence on the part of the Council. Her Solicitor, however, said the action was not framed upon negligence, but upon the ground that the Council, having control of a dangerous substance, did not keep it on their own premises, but allowed it to go on the plaintiff's premises, and so cause injury. Mr. Brough, for the defendants, refuted this argument by stating that the Council were dealing with a dangerous article, but were doing so under statutory authority. His Honour Judge Ruegg, K.C., held that such an action, in order to succeed, must be based upon negligence. The plaintiff had not attempted to prove that there was any specific negligence on the part of the Council, and that they were wanting in any reasonable precaution which was usually taken by gas suppliers; and he gave judgment for the defendant Council. Mr. Brough said the Council had every sympathy with the plaintiff, and did not ask for costs.

The Failure of Meldrum Bros.

In connection with the failure of Meldrum Brothers, Limited, the Official Receiver in London reports that the Company was registered in 1900, with a nominal capital of £125,000 (increased in May, 1903, to £150,000), and was formed to purchase and carry on as a going concern the business of manufacturers of forced draught furnaces, mechanical stokers, &c., carried on by Meldrum Bros. in Manchester and elsewhere. In 1901, negotiations were completed for the purchase by the Company of about 4½ acres of land at Timperley Junction, near Manchester, and upon it works and offices were erected at a cost of about £20,000. In June, 1906, these works and property were mortgaged for £20,000. The accounts show total liabilities £44,000, of which £21,764 are stated to be unsecured, and a surplus of £9605 is claimed. With regard to the shareholders, a deficiency of £114,611 is disclosed.

Bankruptcy of a Gas Engineer.

At the London Bankruptcy Court last Thursday, the first meeting of creditors was held under the failure of Sydney James Henry Willey. Mr. Egerton S. Grey, who attended as Official Receiver, stated that the debtor had filed a statement of affairs showing unsecured liabilities amounting to £2031, and assets £30; leaving a deficiency of £2001. The debtor had informed him that he had been engaged since 1893 in the business of his brother, Mr. H. W. Willey, trading as Messrs. Willey and Co. He was for some years employed as traveller to the firm, and for three years lived at Cardiff, but came to London and was appointed London Manager some ten years ago. About four years since, his brother converted the business into a joint-stock company, with a capital of £100,000, and gave debtor £1000 worth of shares fully paid. Subsequently he bought another £1000 worth, which he paid for out of his salary. He had none of these shares at present, having sold or pledged them as security with creditors. He was now in the employ of the Company as London Manager and Director; his remuneration being £500 per annum, with £100 a year as Director's fees, in addition to commission. Altogether his income amounted to about £1600 per annum. He had for some years been in the habit of borrowing money, in respect of which he had paid heavy interest and law costs. A private meeting of his creditors was held on the 6th ult., but no statement of affairs was laid before them. An offer was made on his behalf of 6s. 8d. in the pound, which the creditors declined to accept. He attributed his failure to being charged heavy rates of interest and expenses to which he had been put in borrowing money to pay off other debts. He had not lived beyond his means; but his expenses had been very heavy. He gave a bill of sale to his wife in July last for an advance of £171, which money he paid into his bank. He had transferred some of his shares to his wife, and others were in the hands of creditors. The debtor's solicitor asked for an adjournment of the meeting, in order that he might bring forward a proposal to pay the creditors a composition of 7s. 6d. in the pound. A gentleman in Exeter was willing to guarantee this; but unfortunately the matter had not been completed in time for the meeting. After some discussion, the creditors decided to adjourn the meeting for three weeks.

Devonport Water-Works Extension.—A beginning has now been made with the construction of the new reservoir at Crown Hill for the improvement of the Devonport water supply. The work will be carried out by the Corporation under the direct supervision of Mr. F. W. Lillicrap, the Water Engineer. The reservoir will have a capacity of 20 million gallons, and is expected to be completed in two years; the estimated cost being £31,000.

MISCELLANEOUS NEWS.

DANISH GAS COMPANY.

Increased Prosperity—New Works—Additional Capital—The Investment of Reserves.

The Annual Meeting of this Company was held last Friday, at the London Agency, No. 13, Victoria Street, S.W.—Mr. CORBET WOODALL in the chair.

Mr. H. G. WARREN (the London Agent) read the notice convening the meeting; and the report and accounts, which were referred to last week, having been taken as read, were then presented for adoption.

The CHAIRMAN, in moving a resolution to this effect, said the Directors regarded the report and accounts as satisfactory. It was true the net balances from the stations were £1000 less than they were in 1906-7; but the reasons for this were not of a nature to cause concern. The price of coal in the year ending June was about 3d. per 1000 cubic feet more than in the previous year; and, after allowing for the improved value of coke, it was still 1½d. more. But this was nearly covered by the increase in the price of gas which was authorized by the sliding-scale operating in Denmark. There was, however, a considerable increase in the amount paid for wages, and, in addition, 2·1d. per 1000 cubic feet had been expended in excess of that spent in 1907 on repairs, renewals, and depreciation of works. These two items together gave a total of above £11,500, of which more than three-fourths represented not a diminution in profits, but an improvement in the condition of the undertaking, due to still better provision for depreciation. It seemed therefore that, had the expenditure followed the same lines, the profits in the present accounts would have been greater, and not less, than in 1907. The increase in the sales of gas had been maintained; and worked out to about 8 per cent., which was gratifying, having regard to the circumstances of Denmark during the greater part of the year, and, especially, as the increase had been general over all the towns supplied. The usual interim dividends were paid in March last; and after providing for debenture interest and for the contribution to the reserve and redemption fund, there was now an amount of £66,191 available. Out of this the shareholders were asked to declare a dividend of 2½ per cent. on the preference shares, with a proportionate sum upon the new issue of £20,000, and 5 per cent. upon the ordinary shares. In view of the good results of the year's working, the Directors had decided to recommend that a bonus corresponding with that of last year—viz., 1 per cent.—should be paid upon the ordinary shares. He was anxious this should not be regarded as a permanent addition to the dividend, though, if circumstances would allow of it becoming so, nobody would be more glad than he to see it continued. During the year, the expenditure on capital account was considerable—viz., £40,264. The chief items upon which this sum had been spent had been the new works at Flensburg, new water-works and gas and water mains in the district of Tikjob, and the new offices at Frederiksberg. Mains, services, and meters had totalled to about £12,000. This was a time of considerable activity at the stations; extensions were the order of the day everywhere. During the past year, they had extended, and to a large extent reconstructed, the works at Odense. At Frederiksberg, they had brought into use a new retort-house. At Flensburg, two additional beds of retorts had been erected, to make secure the supply for the coming winter while the new works were being built. At both Aalborg and Randers, new gasholders in steel tanks were in process of construction. At Viborg, a new retort-house had been built, and would be in use this winter. At Elsinore and Assens, the capacity of the works would have to be extended very shortly. All this was exceedingly satisfactory, because it was due to the continued growth of the Company's business. But it, of course, involved the necessity for the subscription of additional capital. He had mentioned on previous occasions that some of their contracts were approaching maturity. Flensburg was a case in point. The shareholders were acquainted with the situation generally in this town. The present contract reached its end in 1914; and the Magistrates of the town had intimated to the Board that there would be no renewal. The present works were not capable, without reconstruction, of supplying sufficient gas for the period that remained. Further, if they were reconstructed, the town would not take them over from the Company; the situation they occupied being required for the improvement of the town, and being further regarded as unsuitable for large gas-works. The Directors had been obliged, at the eleventh hour, to commence building new works on a site belonging to the town, which was situated on the fjord, and very suitable for the purpose. When these works were finished, they would have added largely to the Company's capital. The expenditure was absolutely necessary; and the Board thought the terms for the ultimate transfer, arranged after much negotiation, were reasonably fair. The manufacturing station would be valued by engineers, as would also the mains, meters, &c. As the shareholders were aware, a considerable sum had been put by for amortization; and, as the whole of the plant at the station would be in excellent order, they hoped the transfer would not entail very serious loss. There was, however, always considerable uncertainty as to the issue of arbitrations. At Randers, the contract had still six years to run. The Municipality, however, were wishful to take over the undertaking immediately. One of his colleagues (Lieut.-Col. Davidson) and himself had met the Technical Committee of the Council in Copenhagen in the spring of the year, and discussed the matter with them. They had agreed that, if the Council pressed for an immediate transfer, the Company would not stand in the way—the Municipality undertaking to purchase at the present value the profits the Company would have earned from the date of transfer until the end of the contract. The concession provided the machinery for the valuation of the works and plant. The amount to be paid for the surrendered profits had been practically agreed; and it seemed not improbable that the transfer would be completed in the course of next year. The immediate future of the Company from a financial point of view would, of course, be affected materially by the action taken at Flensburg and at Randers. The moneys received from the two undertakings would come in aid of the capital account, and would proportionately reduce the necessity for raising further sums. The additional capital the Directors were asking for at present would be used largely for the construction of the Flensburg works. A resolution would be moved on this occasion authorizing the issue of £100,000. It was the intention of the Directors to offer at once to the shareholders 3500 ordinary shares of £10 each at a price of £12 10s. This would yield £43,750. The Board proposed at the same time to withdraw one-half of the ordinary shares now held by Trustees for the shareholders, and forming part of the capital account, and to transfer the amount to the reserve and redemption fund. The new £35,000 would take the place of the money so transferred, and would leave the capital account of the Company undisturbed. Regarding the investment of the Company's reserves in their own capital, such investment would be contrary to law in England, but was quite legitimate in Denmark; and, being so, he thought the transaction was a wise one in the interests of the Company. The Chairman then quoted resolutions passed in 1879, 1883, and 1895 authorizing the formation of a reserve and depreciation fund, and the creation and issue of shares representing the amounts advanced from the reserve and depreciation funds, and expended on capital account. In this way, £100,000 of the Company's savings was invested in their own shares. In 1899, some 3000 of these shares were distributed as a bonus among the shareholders, and so they reached the £70,000 which now stood in the capital account. He was glad to say that, notwithstanding the large sums spent from year to year on capital account, the amount expended in proportion to the business done was steadily reducing. Within the past nine years, the invested capital had increased from £526,000 to £827,000, or 57 per cent., while the amount per million cubic feet sold had diminished from £796 to £695, or nearly 13 per cent. The net revenue in the same period had increased by 49 per cent.

Lieut.-Col. C. M. DAVIDSON seconded the motion.

Mr. BAIRD expressed the gratification the shareholders felt at the continued progress of the Company, and congratulated the Directors on the very satisfactory balance-sheet before the meeting. He had listened with considerable interest to the remarks the Chairman had made with regard to the increase of the capital, because this was a matter of great importance, and he was sure it was one that had received every attention at the hands of the Board. He noticed that since June, 1906, there had been an increase altogether of £110,000 spent on the works—that was to say, £50,000 in 1907, and £40,000 in 1908, and an increase of £20,000 to the debit of capital account. In addition, there was a loan of £5000 at the bankers, and there was a diminution of cash in Denmark and London of £25,000. There was no doubt it was satisfactory that this large outlay should be accompanied by a corresponding increase in the consumption of gas; and the reasons given in the report in reference to the diminution of profits he was sure must commend themselves to everyone. The fact that a larger amount of money had been applied in connection with the plant of the Company out of revenue was a course which was an excellent one. Regarding the reserve and redemption account, £11,000 had, as usual, been transferred to capital; but he regretted to find the investments outside the business had only increased by £4000—that was, so far as he could make out. He had on previous occasions referred to this matter, as he thought it one of great importance. His contention was that in a Company like theirs, where every year there was a substantial sum spent upon works and other things in connection with the business, an equal, or very nearly equivalent substantial sum should be applied either in writing down the value of the works, or, if this was not done, it should be invested outside the business, so as to be available. But neither of these courses was now being followed. Instead, a sum was transferred to the credit of reserve and redemption account, and then disappeared in the business. It could not be got hold of, supposing some catastrophe occurred causing a great destruction of the Company's property, or supposing concessions in some of the Communes were cancelled, and the works were taken over, as they would be, by the Commune at a very considerably lower price than the Company had expended upon them. How, then, could the Board lay their hands upon the money to provide for these things if it was employed in the business? A transfer of this sort was merely a book entry, and was not a tangible amount of available cash. Considering the increase in capital that had been going on, and the rapid strides during recent years, he felt justified in asking the Directors to ponder the advisability of making the Company's financial position equally strong.

Mr. WARING, referring to the new issue of shares at £12 10s., asked whether it would be possible to issue them in such a way that the calls would be paid by instalments, or would the Directors wish them to be paid up at once.

The CHAIRMAN, in reply, said the Board would wish the amount paid up immediately. The money was wanted; and it would be convenient to have it at once. As to Mr. Baird's remarks, the question he raised had been under consideration at two previous meetings. On each occasion, the criticism had been received with the consideration and respect that it demanded. At the same time, he was bound to say that on neither occasion had his view of the correct policy of the Company been influenced one jot. The honourable shareholder said that the Company had not in recent years increased their financial reserves in proportion to the increase in capital and, as he (the Chairman) understood, general prosperity of the Company. They had now some £250,000 of reserves put by, and this against a capital of £800,000, which seemed to be a very fair proportion. The main question was whether these reserves were available in case of emergency. One emergency suggested was the loss of the concessions, which was, of course, always imminent. They had, as he (the Chairman) mentioned in his opening observations, two towns in which it was likely the business would be closed up in comparatively recent years; but, in each of these cases, the position would be not that they would require a large sum of money to bring into the undertaking, but that the transfer would bring a large sum of money for which they would want investment. In each case, the purchasing authority had to pay the Company for the value of the works; and in one case the purchase money would be considerable. Now apart from this, the only suggestion of a possible need for large sums of ready money was some disaster that might overtake one of their works. Well, he thought the Board had provided for this by putting aside as

they had done more than £100,000 in outside securities. When they started to form this fund of £100,000 about nine years ago, they decided to invest in securities bringing in about 3½ per cent.; but they were paying the shareholders for the new capital that was raised an average of about 6 per cent. It appeared to him that it could not be prudent finance to be calling for subscriptions of capital from the shareholders on which an average of 6 per cent. was paid, and at the same time be investing money in outside securities that yielded only 3½ per cent. They had the money invested in their own works; but if they were to invest outside so long as the undertaking as a whole was growing, the Board must ask the shareholders to provide the whole of the money to be so invested. His own feeling was absolutely one of confidence that the policy pursued by the Board was the right one. So long as they had enough for reasonable contingencies in outside securities, there was no better investment for their money than in their own concern. If it were a non-progressive and stationary company, the matter might take a different form. But when they were wanting fresh money provided for the extension of the business, then it seemed to him it was wrong for them to be calling for money from outside, and investing their own available profits at a low rate of interest. On these grounds, he felt he could not promise that the Board, although they would give the fullest consideration to the observations so excellently placed before them, could give the least encouragement to the idea that they would alter the policy as pursued so far.

The motion was unanimously carried.

Proposed by the CHAIRMAN, and seconded by Lieut.-Col. LEWIN, a final dividend was declared for the year of 2½ per cent. on the £150,000 preference shares, 1¾ per cent. on the new issue preference shares, and 5 per cent. on the ordinary shares, with a bonus of 1 per cent. on the latter.

Lieut.-Col. DAVIDSON moved, and Mr. R. S. GARDINER seconded, the re-election of Mr. Corbet Woodall as a Director of the Company.

The motion was cordially passed.

Mr. BAIRD proposed, and Mr. HARBY seconded, the reappointment of the Auditors (Mr. Edwin Waterhouse, F.C.A., and Major E. A. Critchley); and this was agreed to.

Moved by the CHAIRMAN, and seconded by Mr. J. H. BIRCHENOUGH, C.M.G., the Directors were authorized to cancel 3500 shares out of those created by resolutions passed in 1883 and 1895, and to credit the reserve fund with the amount; and, further, to create and issue, as they may deem expedient, additional capital not exceeding in the aggregate £100,000.

On the motion of Mr. BAIRD, seconded by Mr. T. WILKINS, a hearty vote of thanks was passed to the Chairman, Directors, and staff.

The CHAIRMAN, in his acknowledgment, referred to a visit he had recently paid to Denmark, and eulogized the work that is being done by the Company's Agent in Copenhagen (Mr. Cridland), the Engineer (Mr. Edwards), and the London Agent (Mr. Warren).

SOUTHAMPTON GAS COMPANY.

Half-Yearly Report.

The following is the report of the Directors of the Southampton Gas Company for the half year ending the 30th of June.

The profit and loss account shows that, after payment of debenture interest and all other charges, the amount available for distribution is £14,729. The Directors recommend the payment of maximum dividends amounting to £13,229 for the half year on the ordinary stock, less income-tax; leaving £1500 to be carried forward. The sum of £1159 has been added to the reserve fund from the balance brought forward last half year. The total amount invested in this fund up to June 30 last was £50,652.

The increase in the quantity of gas sold during the six months, when compared with the June half of 1907, was 24,427,000 cubic feet; and the Directors are pleased to state that this is the largest increase recorded for a June half year in the history of the Company. There is again a considerable improvement in the sales of residual products. There was an addition of 700 consumers on the prepayment meter system during the half year. The Directors are also pleased to report that there has been the very satisfactory increase of 487 ordinary consumers in the past twelve months. Gas-fires continue to be popular; and the number of gas cooking-stoves on hire has increased to 3930. The extension of the Company's mains to Netley and the surrounding districts, involving considerable expense, has been completed. The works are in all respects in a very satisfactory condition, and fully capable of meeting all demands for gas throughout the coming winter.

BRADFORD AND THE PURCHASE OF GAS-WORKS.

The Bradford Corporation are proposing to promote a Bill for various purposes in the next session of Parliament; and it was considered by the City Council last week.

With regard to a clause to enable the Council to purchase the portions within the city of the gas undertakings belonging to private companies now supplying gas to the citizens, the Town Clerk explained that the words "portions within the city" had been taken out, and the word "whole" had been substituted. Mr. Geldard, in moving the rejection of the clause, said the Gas Committee had sufficient plant to supply the whole of the city without having to pay exorbitant prices for the undertakings of Pudsey and Drighlington. The gas concerns purchased on the last extension of the city boundaries cost £488,000; and £33,000 a year was being paid in interest and sinking fund charges, while most of them were closed nearly the whole year round. Alderman Hartley said it was not true that the Corporation could supply the districts in question without buying out the Companies. They had plenty of plant, but no power to supply. It was not the works they wanted, because the works were not worth buying. With regard to the previous purchases, the plain truth of the matter was that they were robbed; and they might be robbed again. But in the meantime, a large number of the citizens were being robbed; and the question was which was the bigger evil. Alderman Land asked whether Mr. Geldard had the same objection to the purchase of the Ripley Gas-Works, for the arguments which applied to the one case held equally good in the other. Mr. Dobson pleaded for justice for Thornbury and Tyersal. After further discussion, Mr. Geldard said it seemed to be the general wish of the Council that he should withdraw the amendment; and he would do so. But he would just like to say that he sympathized as much as anybody with the people who were having to buy dear gas.

SALFORD CORPORATION GAS UNDERTAKING.

Purchase of Land—Proposed Reduction of Illuminating Power.

The Salford Town Council, at their last Meeting, had before them a recommendation by the Gas Committee to accept an offer for the purchase of certain land for extensions, and a proposal that power should be sought in a contemplated Parliamentary Bill to reduce the illuminating power of the gas to a standard of 14 candles. Both suggestions were agreed to.

Speaking on these subjects, Alderman Phillips, the Chairman of the Gas Committee, said that the extension of the works had been going on for years, and they had now reached the full capacity of the plant. The capacity of the gasholders was about 7 million cubic feet; and the largest daily output had reached 9 millions. These figures showed how important it was that extensions should be made if the trade of the town was not to be subjected to interference. The land would enable them to build the extensions in instalments, and give them access to two railways. The Gas Committee proposed to reduce the illuminating power of the gas, because the old standard was no longer necessary on account of the great use of mantles. Parliament had granted permission to about thirty authorities to reduce the illuminating power from 18 candles to 14, and in two or three cases to 13 candles. He thought that 10 candles would be sufficient. All that was proposed, however, was a reduction from 18 candles to 14. An ordinary flat-flame burner consumed 5 cubic feet of gas per hour, and a mantle burner 3½ feet. The former gave an 11-candle power light, and the latter a 55-candle power light.

PROPOSED GAS EXTENSIONS AT BIRKENHEAD.

At their Meeting last Wednesday, the Birkenhead Town Council had before them a report of the Gas Committee in regard to the proposed extension of the gas-works at a cost of £114,000—£84,000 of which would be for improvements on the old site, and £35,000 on holders on the northern side of the town. The report stated that some part of the proposed expenditure might be defrayed out of the renewals fund, amounting to £29,000. The cost of the buildings for the carburetted water-gas plant, which would be about £5000, might be met in this way.

The Chairman of the Gas Committee (Mr. J. H. M'Gaul), moving the adoption of the report, said the proposed extensions would meet the needs of the town for twenty-five years. The gas-works had been more economically conducted than any other of the Corporation undertakings. The pressure of gas at the north-end was insufficient; and if the scheme was not carried out, it would be necessary to lay down a supplementary main. The quantity of gas which the works were at present capable of manufacturing daily was nearly 4 million cubic feet. It was proposed to extend both the manufacturing and storage plant by the acquisition of land in the immediate neighbourhood of the works, and the securing of other land at a distance from the works.

In the course of the subsequent discussion, Mr. Dodds expressed the opinion that the Council ought to be careful before sanctioning such a large expenditure. It had been stated in a previous report that the ratepayers had received in seven years £50,000 profits from the undertaking. For the past twelve years, the Gas Committee had returned £96,000; but during the same period the Committee had borrowed £91,000. So that, taking income over capital expenditure during the last twelve years, there had been a net profit to the ratepayers of £5000. Of course, in addition to this there had been a profit to the ratepayers on the sinking fund. In regard to the scheme, it was a good one; and he would support it up to a point. He, however, asked the Council to take it back, with the view of reducing the cost. If there was a reserve fund, the Council should make use of it. The Local Government Board might insist upon the Council discharging some of their liabilities on the old site before they entered upon the new scheme.

Alderman Bloor said this was not an unremunerative expenditure they were contemplating; but the money would be returned to the ratepayers in one form or another. If the scheme were carried through, he could assure them there would not be an increase in the price of gas. The improved system of manufacture would more than half meet the interest and sinking fund.

The scheme was eventually approved; and the Council agreed to the application to the Local Government Board for a Provisional Order.

New Issue of Barnet Water Stock.—It will be seen from an announcement which appears elsewhere that the Barnet District Gas and Water Company are inviting tenders, which will be received up till the morning of the 18th inst., for £20,000 of "D" water stock, at a minimum price of £102 10s. per £100. The maximum dividend on this class of stock is 7 per cent. per annum; and for the half year ending the 30th of June last the dividend declared was at the rate of 5¼ per cent. per annum.

WARRENPOINT COUNCIL AND THE GAS-WORKS.

Proposal to Purchase Rescinded.

A Special Meeting of the Warrenpoint Urban District Council was held last Wednesday—Mr. James Wilson in the chair—for the purpose of considering a notice of motion to rescind a resolution previously passed to apply to the Local Government Board for Ireland for a Provisional Order to enable them (*inter alia*) to borrow £4000 to purchase the gas-works. The Clerk to the Council submitted a letter from the Board, stating that they had received the report of Mr. Price, their Inspector, on the inquiry held by him as to the Council's application. [See "JOURNAL" for Sept. 29, p. 867.] With regard thereto, the Board wished to be furnished with definite information as to whether the Council had decided to apply for a Provisional Order under the Gas and Water Works Facilities Act, 1870, as, should they decide to proceed in this way, the first notice in the matter would have to be served by the Council on or before the 1st of November. Mr. Johnston, the Solicitor to the Council, referring to the notice convening the meeting, said their business that evening was to consider whether or not they would rescind the resolution asking for a Provisional Order. Mr. J. E. Connor, the member who had given the notice, said that his principal idea was to afford the members some further opportunity of considering the matter. When the subject came before the last meeting, it was rather sprung upon them, and they did not properly understand it. Some of the members gave their vote in favour of an Order with the idea that when the matter went a little further they could withdraw if they wished. They had since found out that this was not so. Even if the Order were not granted, he understood it would cost £100. They ran a great risk of being opposed; and he held that it would be much more advisable for the Council to get a proper water supply for the town than to expend large sums of money on the gas-works. He moved that the resolution in favour of applying for a Provisional Order be rescinded; and the motion was carried by seven votes to three.

RETFORD GAS AND WATER SUPPLY.

Gas Committee's Annual Report—Reduction in Price.

According to the annual report of the Gas Committee of the Retford Corporation, the gross profit for the past financial year was £2331, compared with £2703 for 1906-7; being a decrease of £372. This is partly accounted for by the increased cost of coal and the low price obtained for residuals; but the Committee point out that the past was the first whole financial year in which the last reduction in the price of gas took effect. The net profit, after payment of interest and instalments on the loans, was £962, compared with £1368 for the previous year—a decrease of £406 due to the above-mentioned causes. In the Committee's previous annual report, mention was made of the high price of coal; and it was intimated that a great reduction in the profits of the undertaking during the ensuing year must be expected. The Committee therefore express their great gratification at being able to still show a handsome profit, and at being in a position to recommend that a further reduction of 2d. per 1000 cubic feet should be made to consumers of gas through ordinary meters, subject to the usual discount of 5 per cent., and a discount of 10 per cent. where gas is used for motive power through a separate meter, and the accounts are paid within the stipulated time. [This will make the net prices about 2s. 2½d. and 2s. 1½d. respectively.] In the case of prepayment meters, the Committee also recommend that a proportionate reduction should be made in the cost of gas, and that 28 cubic feet instead of 25 should be supplied for 1d. The alterations in the charges are to take place from the 1st of January next. It is estimated that these reductions will be equal to about £580 a year; and the Committee trust that this will be appreciated by the consumers, and be the means of further increasing the demand for gas for the various purposes for which it can be used. The Committee have been able to purchase their coal supply for another year at a slightly reduced price, which, however, is still considerably higher than the average of recent years. They are pleased to report that there was again a substantial increase in the quantity of gas sold, due to the growing demand for gas for cooking, heating, and motive power purposes which was encouraged by the previous reduction in price. The Engineer and Manager (Mr. J. B. Fenwick) reports that the works and plant are in good order, and are in a satisfactory condition in every respect. We may add that the efforts of Mr. Fenwick, who has the loyal support of his Committee, have resulted, during the past few years, in the reduction of prices to the extent of 30 per cent., and the abolition of meter-rents.

The water undertaking had rather an eventful year, owing to the Corporation having to oppose the Lincoln Water Bill, which, as it was originally framed, would have been a serious menace to the Retford supply. Though it was never seriously thought that it would be possible to have the Bill thrown out, it was of vital importance to protect the interests of the borough by having protective clauses inserted to confine the Lincoln Corporation to certain limits within which they could take their water, and also to supply the inhabitants of Retford on reasonable terms, if they should at any time need it. They were also limited as to the quanity of water they were allowed to take out of the county. The whole of the clauses were amicably arranged to the entire satisfaction of both Corporations, due in a great measure to the tact of the Town Clerk (Mr. W. P. Jones) and the Engineer, who took an active part in providing the local evidence against the Bill, both for the Borough Council and for the Rural District Council.

The following is an abstract of the Water Committee's annual report: The water-rates for the past year amounted to £2906, compared with £2879 for the previous year—showing an increase of £27. This the Committee regard as satisfactory, considering the slackness in the building and other trades and the large number of empty houses. The net profit for the year, after paying the usual instalments and interest on the loans, would, in the ordinary course, have been £415, compared with £347 before; but the costs in connection with the opposition to the Lincoln Water Bill, amounting to £520, were all charged against the income account—thus making a loss of £104 on the year's working. The amount standing to the credit of the profit and loss account is £56. The Engineer and Manager reports that the works, plant, and machinery are in good order. The Committee state that the supply of water continues good, both in quality and quantity; and they consider that the borough has every reason to be satisfied with the general condition of the undertaking, both structurally and financially.

ELECTRICITY SUPPLY IN LONDON.

Suggestions by the Board of Trade.

Our readers are no doubt aware that a Committee of the House of Commons have now under consideration the London and District Electricity Supply Bill. While the Government were anxious to see the Bill investigated by a Committee and given a fair chance on its merits, the Board of Trade had no intention of endorsing its details. As there was no alternative proposal before the House, the Government were desirous that an effort should be made to pass the Bill this session, provided it satisfied the Committee and the promoters would accept certain amendments. The Board have embodied these in a report, which has been sent to the Committee. They suggest, in regard to the clause governing the conditions affecting the supply of electricity in areas where this already exists, that it is a matter for consideration by the Committee whether further protection against competition could not properly be given to those distributors who can show that they are exercising their powers with due regard to the interests of the public in respect of the supply of energy for power purposes. The Board call attention to the fact that the period of 52 years, after which the undertaking will be liable to purchase without payment of compensation in respect of goodwill, exceeds that prescribed by the Electric Lighting Act of 1888—viz., 42 years. They suggest for the Committee's consideration whether there is any sufficient reason for the more extended period. The Board point out that the instruction of the House of Commons provides that purchasing powers shall be conferred on the London County Council, and they suggest that provision should be made not only for compulsory purchase at certain dates, but also for enabling the Council to purchase the undertaking at any time on terms to be agreed by them with the Company. The Board also suggest that it would be desirable to empower the County Council to discharge, by the issue of stock or annuities, the sum payable in respect of the purchase of the undertaking. The Board do not consider it desirable that the Company should be empowered to acquire the undertakings of other bodies without further recourse to Parliament.

COMPETING GAS AND ELECTRIC INCANDESCENT LAMPS.

In the comments in the "JOURNAL" last week on "The New Coalite," reference was made to an article that had been published in the Engineering Supplement to "The Times" from "An Engineering Correspondent." At the close of the article the writer said: "Although statements have appeared that illumination can be obtained by means of tungsten lamps at a cost equivalent to that of the incandescent gas-light for the same degree of light, these optimistic views probably came from biassed sources. Gas-mantles of the inverted type still yield a higher degree of illumination than tungsten lamps for the same cost of energy—prices of gas and electricity remaining as they are. It appears unlikely that the efficiency of the tungsten lamp will be improved much beyond 1·2 watts per candle, nor is there much prospect of the efficiency of the incandescent mantle being much improved. Present efforts have been directed rather towards increasing the stability of the mantle, and preventing the falling off in candle power which occurs during its life. There is, however, one direction in which the gas companies might compete with electricity on more favourable terms, and that is in lowering cost of production. Now that gas is rarely used for its inherent illuminating capacity, but is almost always employed in conjunction with a mantle where calorific power is alone of consequence, why should not producer gas be served to consumers? In recent years, so much attention has been paid to the production of cheap gas for internal combustion engines that the gas companies would be in a position to supply gas of good calorific power at a much cheaper rate than they at present deliver illuminating gas. The candle power of the gas supplied is of no consequence when incandescent mantles are used, and producer or water gas would serve the purpose equally well. If the gas companies wish to prevent their customers from going over to electricity, in view of the advantage offered by high-efficiency electric lamps, this seems the most practical method of competing successfully with their rivals."

ACTON ELECTRICITY SUPPLY UNDERTAKING.

Cost per Unit, 5·63d.; Price Obtained, 4·25d.

Sir Alexander Kennedy has issued a supplementary report upon the Acton electricity undertaking. In the course of it, he says that the loss, which in the first year was £2615, amounted in the last financial year to £2934. For every 100 units sold by the Council, 9·4 units were lost in distribution or unaccounted for, 16·8 units were used on the works, and 38·7 units were lost in transformation—making 165·1 units bought in bulk for every 100 units sold retail. The cost of every unit bought from the Metropolitan Company (including capital charges) was 5·63d., and the average price obtained was 4·25d.; there thus being a loss of 1·38d. on each unit sold. Sir Alexander points out that the loss on distribution is reasonable. The high percentage used on the works includes the loss on charging and discharging the battery. The very large loss by transformation is due to the fact that the machines in use are by no means efficient, and are unavoidably often worked at low loads. The price actually paid to the Metropolitan

Company was 1·15d. per unit purchased. The agreement made with the Company is terminable at the end of 9, 18, or 27 years; and the undertaking is now in its fourth year. An "unofficial" offer has been made to the Council by the Metropolitan Company, and is now under consideration. This offer is to the effect that, while the Company are not willing that there should be any reduction in the total income of about £4000 they received last year from Acton for current purchased, they are prepared to make such concessions in price as would enable Acton to obtain a much larger amount of current than hitherto for this charge. Sir Alexander Kennedy recommends the acceptance of the Company's offer, and points out that under these conditions the Council would, no doubt, as soon as possible restore the electric street lighting, and make every effort to obtain additional large customers for power.

At the last meeting of the Council, the following resolution was passed: "That the Clerk of the Council be authorized to interview the Brentford Gas Company with power to act on the following basis: That the offer of the Gas Company to supply the street lighting for five years at the saving of £385 per annum be accepted, with the proviso that the Council may at any time terminate the agreement provided it reimburses the Gas Company the difference between that amount and the price now paid for gas lighting."

CHARGE FOR WATER IN THE CITY OF LONDON.

Protest by Ratepayers.

In accordance with a numerously signed requisition, a meeting of bankers, merchants, and other ratepayers of the City of London was held at the Mansion House last Wednesday, under the presidency of the Lord Mayor, "to protest against the excessive charges for water levied by the Metropolitan Water Board, under the Act which came into operation on April 1, 1908." There was a large attendance.

The Lord Mayor, in opening the proceedings, said those who had requisitioned the meeting were fully alive to the fact that the present Water Board were not responsible for the Act of Parliament which had given rise to the existing agitation, but they certainly were for its administration. The Chairman of the Board (Mr. E. B. Barnard, M.P.) had made a speech which might well be summarized as a defence of the staff; and he (the Lord Mayor) did not consider it necessary to waste time by replying to it in detail. The real issue before the meeting was whether the City and its ratepayers were to pay for the water used, or upon the assumption that those should pay who had the ability to do so. The Water Board boasted that they were not to blame, and that there was no extravagance. Let them analyze some of the figures. In reply to a question put to him in the House of Commons, Mr. Burns admitted that there were a hundred more clerks in the Board's service than were employed when there were eight Water Companies to be managed. The last year of the Companies' accounts (1901-2) showed that their expenditure on revenue account, which included maintenance and management, amounted to £1,130,537. The accounts of the Water Board for the year ended March 31, 1907, showed the expenditure under the same headings to have been £1,392,783, or an increase of £262,246. In management alone there had been extra expenditure to the extent of £16,177 during the same period. As City ratepayers, they did not ask for any special rebates. All they asked for was common fairness, and to be allowed to pay for the water consumed—extravagantly, if they liked—but not to be crushed by over-taxation simply because of their heavy assessments. If the present policy were pursued, what would be the result? The Water Board admitted that they had already lost "to the tune of £6000 a year" by the sinking of wells. What would happen when all the wells now in course of construction were in use? The Bank of England, the Baltic, Lloyd's, and the new bank which was being erected on the site of Crosby Hall had all sunk, or were sinking, wells. Any one travelling outside the London area must have noticed that factories were springing up in all directions. Why was this? Because it was impossible for manufacturers to bear, in addition to existing great competition, the enormous strain of over-taxation, including excessive water-rates.

Sir Albert Spicer, M.P., moved—"That this meeting of ratepayers in the City of London deprecates the action of the Water Board in enforcing at the outset its maximum statutory powers, and protests against the largely increased charges for water in business premises on the basis of rateable value, having regard to the relatively small consumption of water on such premises when supplied otherwise than by meter; and that copies of this resolution be sent to the President of the Local Government Board, the Metropolitan Water Board, the Corporation of the City of London, and the Metropolitan Borough Councils." He said the complaint was that the Water Board had chosen to enforce maximum charges during the first year of the operation of the Act, without waiting to find out by experience whether a less drastic method might not have been sufficient. The interests especially represented at this meeting were those which were rated very highly on the one hand, while on the other they were users of very small quantities of water. Proceeding to give cases of the increase in the water-rate since the new Act came into force, he mentioned that a large Insurance Company now had to pay £1117 for their water compared with £688 before the passing of the Act; and he thought it would be agreed that this was a serious extra burden.

Sir George Woodman seconded the motion.

Sir Charles Wyndham, in supporting the resolution, said the interests he represented were most seriously affected by the course which had been adopted by the Water Board. It might safely be stated that the average rating of the West-end theatre was not less than £5000 a year. The Water Board had not met them by giving them the benefit of the extreme abatement which they were able to give; they had only allowed 20 per cent. The result was that the average amount which a London theatre had to pay for water was no less than £200 a year. On the other hand, how much water did the theatres use? Materials had been put before him which enabled him to say that the average annual consumption of water in a London theatre was not more than 700,000 gallons. What was the result? The price paid by the theatre manager was no less than 5s. 6d. per 1000 gallons; whereas the maximum price which the Water Board had a statutory right to charge by meter under their Act was 11d. There was not one of them who would not be quite prepared to pay a fair and proper charge for the water he consumed, whether it was actually at the maximum or even more; but they were asked to pay no less than six times the amount of the maximum charge authorized. He submitted that it was a hardship, and one in respect of which they were fairly justified in complaining.

The motion was unanimously agreed to.

Sir F. Dixon-Hartland, M.P., proposed—"That this meeting further urges upon the Corporation of the City of London, the London County Council, and the Metropolitan Borough Councils the importance of instructing their representatives on the Water Board to support a reduction of the present charges, or an increase in the rebate allowable under section 9 of the Charges Act of 1907—thus affording some measure of relief to water consumers." He condemned the extravagant administration of the Board, and said that when such bodies were established the universal experience was that they spent more money and gave less efficient results. Under the new Act, a bank with which he was connected in the City had to pay £3 14s. 9d. per head for the water used by their clerks to wash with. At the Middlesex Asylum, Wandsworth, there was a stand-pipe provided in case of fire. The Water Company used to make a charge of £5 a year for it; but the Water Board's charge was £360 per annum. This was for a mere precautionary supply which had little chance of ever being used.

Mr. Stuart Sankey seconded the motion.

Sir Frederick Banbury, M.P., remarked that the Water Board had never attempted to prove that they were carrying on the undertaking in a business way. The Chairman said they had reduced the hours of labour and increased the wages. This was at the bottom of the whole thing. In order to be popular with a large class of ratepayers, they had imposed on the large ratepayer in the City charges which were obviously unjust.

Mr. J. B. Mulholland, as representing the Theatrical Managers' Association and the Theatres Alliance, supported the resolution.

The resolution was then put, and carried unanimously.

NOTES FROM SCOTLAND.

From Our Own Correspondent.

Saturday.

At their monthly meeting on Monday, presided over by Bailie Bryson, of Leith, the Convener of the Works Committee, the Edinburgh and Leith Gas Commissioners transacted business of a more than ordinarily "popular" nature; the business being cast in this form probably in view of the fact that the municipal elections are in progress. The Finance and Law Committee, by a majority, recommended that in the case of seven workmen who are at present in receipt of weekly allowances the payments should be reduced to 8s. Judge Douglas moved that they do not reduce the allowances. They had, he said, only as recently as April, considered the whole question of pensions, and decided not to touch any of them. The Chairman explained that the men's incomes would not be reduced, because the reduction would give them the opportunity of applying for a Government pension. Bailie Maxton, in seconding Judge Douglas, said that the position taken up by them was that it would be undignified for the Commissioners to reduce their pensioners' allowance to qualify them for a Government pension. The Chairman moved approval of the recommendation, and Mr. Laing seconded the motion. Mr. W. R. Herring, the Engineer, explained that in the case of one man what was proposed would give him 6d. per week extra. He was at present receiving 8s. 6d. The other men were receiving 10s., and would thus only get a Government pension of 3s. If the Commissioners reduced their pension to 8s., they would get a Government pension of 5s.; and they would thus receive exactly the same as if the Commissioners did not make a reduction. Judge Douglas considered it was not becoming in a large corporation like the Gas Commissioners to show such a bad example. He thought it was going behind the Act altogether. The recommendation of the Committee was adopted by eleven votes to three.

Then a letter from the Town Clerk of Glasgow relating to the Local Government (Scotland) Bill, at present before the House of Commons, was read, in which the Commissioners were asked to give their support to a provision restricting the assessment in counties to one-fourth of the valuation of certain properties appearing in the valuation rolls. The Chairman explained that the proposal was that the assessment upon gas and water pipes in counties should be, as it already was in burghs, upon one-fourth of the value. He thought it was reasonable that they should support the Glasgow Corporation in getting this principle affirmed in the Bill; and he moved to this effect. Dr. Cullen agreed, and mentioned that at the present time the Edinburgh and District Water Trust were, because of the assessment upon full value in counties, paying the greater part of the assessments in county parishes through which their pipes passed; but he thought that the latter should first go before the Works Committee. This suggestion was agreed to; the Committee being granted powers in the matter.

Judge Douglas again occupied the attention of the Commission by means of a letter which he had written on Sept. 29 protesting against what he considered an uncalled-for expense in connection with the recent visit of inspection to the Granton Gas-Works. There had, he said, been three engagements of the same sort within seven months—their annual dinner, a visit to the Scottish National Exhibition, and the visit to Granton. The Chairman explained that the Commissioners had promoted a Provisional Order, and that a discussion had taken place in the Works Committee as to how the gas was tested at Granton. It was suggested, and approved by the Commission, that they should invite the whole of the members of the Corporations of Edinburgh and Leith to Granton, and give them a demonstration as to how the gas was tested. He thought it ill-became Judge Douglas to question the action of the Commissioners. The further discussion of the subject was of a personal nature, and need not be followed.

Judge Douglas brought forward another subject, in the remark that Mr. Herring misled the Commissioners at their previous meeting as to the number of men employed by the Commissioners more than eight hours a day for seven days in the week. He then stated that there were men in their employment working twelve hours per day; and Mr. Herring now admitted this. There were more than fifty men working over fifty-six hours per week; and Mr. Herring did not state so at the previous meeting. Mr. Herring explained that Judge Douglas put a question, in April last, as to the number of men who worked more than fifty-one hours per week, and this was answered by him to the effect that on May 1 there were 253 men working more than that number of hours. With regard to the particular question now raised, he certainly understood him to refer to the men employed at Granton; and he answered that there were no men there, other than the foremen and himself, who worked more than fifty-one hours per week. There seemed to be some misunderstanding in the matter. Altogether, they had nine men, engaged as gasholder and governor-house attendants. They had no physical work to do; their primary duty being to keep an eye on the position of the gasholders, and to telephone to the manufacturing station when the gasholders were sinking, or to adjust a few small weights on the governors. Five of the men were provided with houses, and the other four had comfortable quarters found for them when on duty, where they could spend their time. Most of those men were appointed as a reward for past services. These men were on duty for twelve hours per day; but it could not be suggested that they worked twelve hours. Only one man out of the nine had made any complaint, and it was to the effect that, having been a foreman in the Edinburgh works, he was not transferred to Granton. He had nine foremen out of whom to select three for Granton; and he naturally picked the best. The Commissioners had 800 or 900 men in their employment, and there were only these nine who could be said, in any way, to be working twelve hours a day. He could assure the Commissioners that there was good reason for this, because it would not be convenient nor advisable to divide that work into eight-hour shifts, otherwise it would have been done. He now proposed to relieve the man who had complained, and put him on ordinary day work.

The short leet for the appointment of Gas Manager for Greenock has been drawn up. All the gentlemen who have been selected for the honour are at present Managers of gas-works in Scotland. There will, consequently, be another vacancy in Scotland immediately.

The Gas Committee of the Aberdeen Town Council have had before them an application by Messrs. J. M'Adam and Sons for a supply of gas for motive power to their quarries at Persley. Reporting upon the application, the Manager (Mr. S. Milne) stated that in order to provide the supply it would be necessary to lay 722 yards of 3-inch main, and also to substitute 246 yards of 4-inch for 2-inch main, at an estimated cost of £190. The Committee have recommended the Council to grant the application, on condition that Messrs. M'Adam contribute £30 towards the cost of laying the mains, which are to remain the property of the Corporation, and that the applicants guarantee a consumption of not less than 500,000 feet of gas per annum for four years.

A special meeting of the Lochmaben Town Council was held the other night to consider a request by the Secretary of the Gas Company for leave to open up the streets for the purpose of laying a pipe to the burgh boundary to supply the combination hospital. It having been moved that the request be granted, Mr. Barbour referred to the present scarcity of gas, and expressed the fear that the town might be left without sufficient gas if the hospital were supplied. It was stated that the Company were about to spend £2000 upon their works. Provost Halliday did not think the community would suffer. He was not a shareholder; but he was deeply interested in the Company, for the welfare of Lochmaben. Since the gas question came up, he had done all he could in the matter, in the interests of the burgh; but the Council could not see their way to purchase the works. Another Company had done so. He was confident that they were not taking any course inimical to the interests of the ratepayers, or, indeed, of any single individual.

The Stewarton Town Council held a special meeting last week to hear a report by the Lighting Committee as to the allegation made by the Manager of the Gas Company (Mr. M. D. Campbell), by letter to the Town Council, that the stopcocks upon meter lamps were not being turned on full. The Committee reported that they had thoroughly investigated the affair, had made full inquiries of the lamplighters, and had arrived at the conclusion that there was little in the matter. It was admitted that the meter lamps with incandescent burners were not turned on full; but these were being treated on exactly the same lines as all the other incandescent lamps, which had to be regulated in order to secure the best light. Mr. H. Cunningham, the Convener of the Committee, moved that the Gas Manager's letter be replied to to this effect. Bailie Sim considered that, for the credit of all concerned, the whole matter should be thrashed out in conference with the Directors of the Gas Company, and that at that conference the lamplighters, the Gas Manager, and any witnesses should be present. This proposal became the finding of the Council. Mr. Campbell's letter was to the effect that he had noticed that the stopcocks of the burgh lamps were not properly turned on the same as the others, and that as the failure to do this was a serious matter for the Gas Company, the question would in all probability be laid before a meeting of the Directors at an early date. When the letter was submitted to the Council at their previous meeting, it was characterized as "amounting nearly to a charge of dishonesty;" and the matter was remitted to the Lighting Committee to make investigation and report.

New Retort-House for Birmingham.—It is stated that, at a meeting of the Birmingham Gas Committee on Monday of last week, it was decided to demolish one of the older retort-houses at one of the works. This will be done with the view of reconstructing the building on modern lines; and the estimated cost of the work is £20,000. It was hoped that the task of clearing the site would be commenced in a week or ten days; and though the Committee's own workmen will be employed as far as possible, the operations will be sufficiently extensive to enable the Committee to give work to about forty men selected for them by the Distress Committee.

CURRENT SALES OF GAS PRODUCTS.

LIVERPOOL, *Oct.* 31.

Sulphate of Ammonia.

There has been a very quiet market during the week. Fresh orders have been scarce; and though current production only is available to satisfy all necessities, it has been somewhat in excess of the demand, inducing a rather easier tendency at the close. Quotations are £11 3s. 9d. f.o.b. Hull, £11 5s. to £11 6s. 3d. f.o.b. Liverpool, and £11 7s. 6d. f.o.b. Leith. In forward delivery, some of the makers in the North have reduced their ideas for delivery over the early months of next year, and £11 13s. 9d. would now probably be accepted for January-March. For November-December delivery, a slight premium on spot prices is still asked.

Nitrate of Soda.

This article is quiet at 9s. 6d. and 9s. 7½d. for ordinary and refined qualities respectively.

LONDON, *Nov.* 2.

Tar Products.

The markets have been quiet throughout the past week. The tone of the market for pitch appears to be decidedly easier, though the majority of the manufacturers are firm in their ideas; but there has been a decided disposition among the dealers on the Continent to accept lower figures. In South Wales, a rather large quantity has been sold at prices considerably under those quoted a week or ten days ago. On the east coast, it is reported that 25s. has been paid. But it is very difficult to believe this, seeing that there have been sellers for some time at 23s. to 23s. 6d. both on the east coast and at its equivalent on the Continent. On the west coast, pitch has been offered at 22s. 6d. Liverpool without success; while at one of the ports suitable for the Swansea market, 20s. 9d. f.o.b. has been accepted for delivery to the end of April next. Creosote is firm. It is stated that a small quantity was sold in London for immediate delivery at 2⅞d.; but the majority of makers ask 2¾d. for either prompt or forward delivery. In the Midlands, the market is firm; but in Yorkshire and Lancashire the makers appear inclined to accept rather lower figures than was the case a short time ago. Benzol is quiet; and business has been done on the east coast at 6½d. for delivery to the end of June. There is no business doing in 50-90 benzol, but it is steady. High-flash naphtha is steady, and a fair amount of business has been done for delivery over next year. Toluol is firm, and in good demand. Solvent naphtha is very firm. There is a large demand for same, and a considerable quantity has been sold in the North at good prices. Carbolic is quiet, and Continental consumers report business at 1s. 0⅛d. east coast ports. Naphthalene is quiet and difficult of sale, and prices have a downward tendency.

The average values during the week were: Tar, 12s. 9d. to 16s. 9d. *ex* works. Pitch, London, 22s. 6d. to 23s.; east coast, 22s. to 22s. 6d.; west coast, 21s. 6d. to 22s. 6d. f.a.s. Benzol, 90 per cent., casks included, London, 7d.; North, 6¾d. to 6⅞d.; 50-90 per cent., casks included, London, 7d. to 7¼d.; North, 6⅞d. to 6⅞d. Toluol, casks included, London, 9d.; North, 8¼d. Crude naphtha, in bulk, London, 3⅛d. to 3⅜d.; North, 3¼d. to 3⅜d.; solvent naphtha, casks included, London, 11d. to 11½d.; North, 10d. to 10⅜d.; heavy naphtha, casks included, London, 11d. to 11½d.; North, 10d. to 10⅜d. Creosote, in bulk, London, 2⅞d. to 2⅞d.; North, 2⅞d. to 2⅞d. Heavy oils, in bulk, 3d. to 3 1/16d. Carbolic acid, 60 per cent., casks included, east coast, 1s. 1d. to 1s. 1½d.; west coast, 1s. 0½d. to 1s. 1d. Naphthalene, £3 10s. to £6 10s.; salts, 32s. 6d. to 35s., packages included and f.o.b. Anthracene, "A" quality, 1⅛d. to 1¼d. per unit, packages included and delivered.

Sulphate of Ammonia.

This article has been steady during the past week, but without any alteration in price, though it is reported that there is rather an easier tone in the market. In London, the Gas Companies still maintain their position; but the outside makes can be secured upon Beckton terms at £11 5s. to £11 7s. 6d. In Hull, £11 5s. has been offered for the best makes, but declined. In Liverpool, £11 7s. 6d. is stated to have been paid. In Leith, the market is nominally £11 10s.; but there is very little business doing at this port—only a small quantity of stocks being available.

COAL TRADE REPORTS.

Northern Coal Trade.

The Northern coal trade shows continued quietness in steam sorts the demand for forward supplies being limited. Best Northumbrian steams are quoted from 11s. to 11s. 3d. per ton f.o.b., which shows a further fall. Second-class qualities are from 10s. to 10s. 9d. per ton, and steam smalls are steady at from about 5s. 3d. to 6s. 3d., the latter being rather more scarce. The production is steady, and so far it is well taken up. In the gas coal trade the demand is increasing, and must be expected to do so for two months to come at least; the shipments to the southern companies being now very much enlarged, while the exports continue good. Durham gas coals vary from about 9s. 6d. to 11s. per ton f.o.b. for the usual classes, with perhaps 6d. per ton more for "Wear specials." There are now few contracts for gas coal reported; the trend of the market towards lower values for forward delivery having evidently a deterring effect, because the full demand at present keeps up the current price. In coke, the market is fairly steady; but the increased production of gas coke is giving ease in the price. Good gas coke is quoted from about 17s. to 17s. 6d. per ton f.o.b. in the Tyne or Wear.

Scotch Coal Trade.

Trade has been quiet; and it is reported that there are no signs of improvement in the immediate future. Ell is in good demand, but there has been rather an easing of prices. Splint is firm, and steam coal is very plentiful. Small sorts are in poor request. The prices

quoted are: Ell, 10s. 3d. to 11s. 3d. per ton f.o.b. Glasgow; splint, 11s. to 11s. 3d.; steam, 10s. to 10s. 3d. The shipments for the week amounted to 305,017 tons—a decrease of 31,772 tons upon the previous week, but an increase of 13,852 tons upon the same week of last year. For the year to date, the total shipments have been 11,957,531 tons—a decrease upon the corresponding period of 189,596 tons.

NEW CATALOGUES.

Messrs. Falk, Stadelmann, and Co., of Farringdon Road, E.C., are sending out two handy catalogues, dealing respectively with the "Metropolis" burner and the "Universe" inverted burner and clusters. As readers are aware, the "Metropolis" is a high candle-power low-pressure burner, designed for street and exterior lighting generally; and it is now made in two sizes, consuming 3 and 4 cubic feet, and developing 75 and 100 candle power. Both take ordinary "C" sized mantles. The "Universe" burner and clusters are intended for converting existing lamps to the inverted system. The clusters are applicable to all lamps, irrespective of shape or size.

Messrs. S. Davis Nicholls, Limited, of No. 56, City Road, E.C., have forwarded a copy of their illustrated catalogue for the ensuing season. This contains particulars and prices of various makes of incandescent mantles, inverted and upright, for domestic, street, and high-power lighting; and also of the "Tweedie" regenerative inverted burners and lamps, a description of which recently appeared in the "JOURNAL." This burner is suitable for all classes of street lighting; and a good range of indoor fittings specially designed for use with it is shown. Numerous other forms of inside and outside lamps are illustrated, as well as Kern radiators, and other appliances for use with gas.

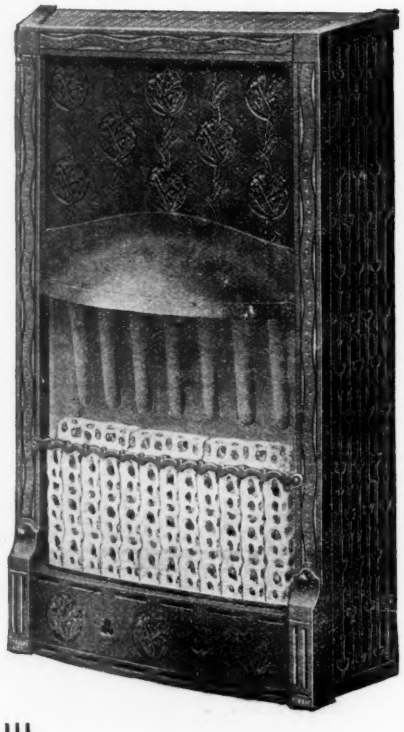
Messrs. S. Clark and Co., of Highbury, have sent us a copy of their new catalogue of gas-stoves, &c., which furnishes particulars of their novelties for the present season. They are placing on the market a new series of condensing stoves; the system employed in which is a simpler form of their well-known "Syphon" principle. It is claimed that perfect condensation and rapid circulation of heat are obtained; while, by simplifying the construction, the firm are able to sell the stoves at exceptionally low prices. The illustrations in the price list show many attractive patterns for use with gas; and it also gives particulars of "Syphon" and other oil-stoves, Clark's patent linen airer, and special gas-stove fittings and sundries.

The Pulsometer Engineering Company, Limited, of Reading, forward a copy of their latest catalogue giving particulars of their Fleuss patent pump for desiccating, or for steam condensers, for which they were recently awarded a diploma for a gold medal at the Franco-British Exhibition. This pump is designed for desiccating, chemical work, distillation, and like purposes; its special feature being that it will pump condensable vapours, such as aqueous moisture, the vapour of alcohol, ether, &c., to a high vacuum as readily as ordinary dry air. The catalogue also contains illustrated particulars of the well-known "Geryk" vacuum pump, likewise invented by Mr. Fleuss, for which the Company were awarded a silver medal, and the inventor a bronze one, at the St. Louis Exposition in 1904. This pump combines the advantages of great simplicity with the power of obtaining a very high vacuum. It can be made any size—up to 100 cubic feet capacity, or more, per minute.

A very attractive winter booklet for the present season has been prepared by the Davis Gas-Stove Company, Limited, giving illustrated particulars with regard to a selection—and a large selection it is—of up-to-date gas heating-apparatus, including their new steamless radiator, to which attention has already been drawn in our pages. The firm have added two new fires to their "Diamond" series; and a new series of cylindrical stoves with luminous flame has also been introduced, as well as a fresh pattern of gas-fire stand. It is pointed out that, while the heating capacity of the firm's gas-fire fuel has been considerably enhanced, the prices have at the same time been materially reduced. As to the booklet itself, it may be remarked that, though the size is a convenient one for the pocket, the appearance renders it deserving of a more conspicuous place. The patent steamless radiator, full particulars of which are, of course, given in the booklet, is also the subject of a separate slip pamphlet, facetiously entitled "An Ought-to-buy-ography, with a Digression on the Power of the Penny." The "digression" is to the effect that, with gas at 2s. 6d. per 1000 cubic feet, a room, 20 feet by 14 feet, may be effectively heated by a four-loop 39-inch steamless radiator for over five hours at a cost of 1d.

Balcombe Water Supply.—The efforts which have been made to provide a more plentiful supply of water at Balcombe, by the sinking of a new well, have proved successful; and the Mid-Sussex Joint Water Board have been notified of the result. An attempt was made to lower the old well; but a fissure drove the men from their work. Both wells have been joined up.

Explosion at the Crays Works of the Bromley and Crays Gas Company.—Early last Wednesday evening, an explosion took place at the St. Mary Cray station of the Bromley and Crays Gas Company, by which the photometer and meter testing-room was entirely demolished. The Chief Engineer of the Company (Mr. William Woodward) and the Station Manager (Mr. Chandley) were sent for, and were soon on the spot; but the fire had already been put out, and all further danger averted, by the foreman in charge. The cause of the explosion is very difficult to explain, as the destruction is so complete. It can only be surmised that the water in the governor on the photometer had run short, and so allowed the gas to escape. Thus the room became charged with an explosive mixture, which was eventually ignited by a gas-heated radiator used for warming the place. The estimated damage is a little more than £300.



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Patent "N.V."

among Gas Fires
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In adapting a Gas-Stove to fit its surroundings so as to seem part of the grate itself,

The Patent "N.V." Method is the Last Word.

JOHN WRIGHT & CO.,
ESSEX WORKS,
BIRMINGHAM.

No. 182.

Charges to Large and Small Gas Consumers at Halifax.

In view of statements made in certain quarters that large gas consumers in Halifax receive their supply at less than cost, the "Halifax Courier" set inquiries on foot, and the following figures were taken from the books at the Town Hall. During the year ending March 31, in a certain district the gas consumed by 466 customers was 4,727,500 cubic feet. For the same period the gas consumed by Messrs. Frederick Smith and Co., Limited, Caledonia Works, was 12,930,000 cubic feet, or nearly three times as much. Therefore, on the above-named basis, the quantity supplied to Messrs. Smith is equivalent to that supplied to 1300 small consumers. To small consumers twelve visits are paid by meter inspectors each year—making 15,600 visits. Four accounts are sent out, or 5200 altogether, necessitating the same number of visits by collectors taking accounts out. Then 5200 receipts have to be given. Against this, 24 visits per year are paid by inspectors to the Caledonia Works, four accounts are sent, and four receipts given. Further, a large consumer has to pay his accounts on an average three weeks earlier than ordinary consumers—an advantage to the Corporation in interest. In the case of small consumers (and this does not apply to the large ones), four visits are made to each district every year to cut off and re-connect, postal notices are sent to late payers, and there is risk of bad debts. The actual cost of gas at the works is 1s. 3½d. per 1000 cubic feet, and the "outside" cost 5¾d.—making the total cost 1s. 9d. per 1000 cubic feet. The net price charged to large consumers is 1s. 10½d., which is thus more than the cost price. The "outside" cost to large consumers is very small indeed—not 1d. per 1000 cubic feet.

Manchester and the Thirlmere Water Supply.—The Chairman of the Manchester Water Committee (Sir Bosdin Leech), together with his colleagues and the Lord Mayor (Alderman Holt), recently proceeded to Caton, near Lancaster, to perform the inaugural ceremony of laying another line of pipes between Manchester and Thirlmere. This new line is the third of the five which the Corporation have parliamentary powers to lay. As a souvenir of the ceremony, the Lord Mayor asked Sir Bosdin Leech to accept a gold pendant bearing on one side the Manchester coat-of-arms in heraldic enamel colours, and on the other side a suitable inscription. The distance from Thirlmere to Manchester is just under 96 miles. An aqueduct has been constructed to convey 50 million gallons of water per day. Then there are 14 miles of tunnel, 36 miles of "cut-and-cover," and 45 miles of pipes. The daily consumption in the city and the district supplied by Manchester in 1879, when the Thirlmere Act was passed, was 17,914,153 gallons. Six years later, when the work of laying the first pipe was begun, the consumption had risen to 19,650,657 gallons per day; and in 1894, the figure was 24,954,141 gallons. In 1900, when a second pipe was proceeded with, the daily consumption was 32,294,958 gallons; and in 1904, when the second pipe was finished, the figure was 32,994,581 gallons. The average daily consumption last year was 38,337,116 gallons.

Louth Gas Company.—The annual general meeting of this Company was held on Monday last week—Mr. W. Cash in the chair. The report and statement of accounts for the year ended Sept. 30 showed a successful year's working. The gross profit showed an increase of 13 per cent., and the income from residuals an increase of 8 per cent.; being nearly 1d. per 1000 cubic feet of gas sold. The total revenue was 3 per cent., or 1⅛d. per 1000 cubic feet of gas sold, higher than the previous year. Dividends were declared of 14¼ per cent. on the ordinary capital, 11¼ per cent. on the new ordinary (1877) shares, and 5 per cent. on the "A" and "B" improvement stock. This would absorb £2005, and leave a balance of £1332, out of which it was decided to place £500 to the contingent fund, and carry forward the remainder.

Keith's High-Pressure Plant at the Scottish Exhibition.—The Keith and Blackman Company, Limited, have sold, as it stands, the whole of the Keith plant used for the lighting of the Scottish National Exhibition at Edinburgh. It has been purchased by a local Syndicate, who have had the installation under close observation during the six months it has been running. The plant consists of two "D" sized rotary gas-compressors coupled direct with suitable gas-engines, and bye-pass arrangements and pressure-gauge board, with all accessories; single and three light lamp-columns, &c; and 127 1500-candle power 1908 pattern inverted lamps, giving an efficiency (with Edinburgh gas) of over 70-candle power per cubic foot of gas consumed. The plant, it is understood, is to be used for a permanent exhibition in the Edinburgh district; and its purchase by the Syndicate, after six months' observation, is certainly as good a recommendation as could be desired for the system.

Nuisances in the City from Producer Gas.—In the report of the Medical Officer of Health for the City of London (Dr. W. Collingridge) for the fourteen weeks ending the 17th ult., it is stated that during the summer four cases of nuisance caused by the discharge of washing water from gas-producer plants had been reported. "It appears," said Dr. Collingridge, "that the use of producer gas in the City and elsewhere is extending, as it is found it effects considerable economy as compared with coal gas. There is, of course, no objection to the utilization of this system of gas plant, provided no nuisance is caused thereby. It is subject, however, to the disadvantage of providing an effluent, the discharge of which into the public sewer, unless efficiently treated, is liable to cause considerable nuisance. The discharge into public sewers of any gas washings is a direct contravention of section 76 of the City of London Sewers Act, 1848. It has been found by experiment that the odour of sulphuretted hydrogen with which these gas washings are charged can be practically eliminated by the use of permanganate of potash, the addition of which to the washings in a settling-tank produces an effluent to which little or no exception can be taken. In all the four cases of nuisance, such use of permanganate of potash had resulted in minimizing the evil. Every case, however, must be dealt with on its own merits, and the effluent examined from time to time."

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Sales of Stocks and Shares.

At the Mart, Tokenhouse Yard, on Monday last week, Messrs. A. & W. Richards conducted a successful sale of gas and water stocks and shares. In compliance with instructions received from the Directors of the Ascot District Gas and Electricity Company, they invited biddings for a new issue of £3000 of 4½ per cent. perpetual debenture stock and some £10 new ordinary shares. The latter rank for a maximum dividend of 7 per cent. per annum; and for the past three years it has been 5½ per cent. The stock was all sold at from £100 to £100 5s. per £100; and the shares were all placed at par. On behalf of executors, Messrs. Richards offered for sale some 4 and 5 per cent. perpetual debenture stock and some 6 per cent. "B" preference stock of the Brighton and Hove General Gas Company. The first-named stock was all sold at par, the second at from £120 to £123 per £100, and the third at £135 per £100—all *cum div.* as from July 1 last. On the same occasion, a few fully-paid "B" £5 shares in the Pinner Gas Company, Limited (last dividend at the rate of £7 17s. 6d. per cent. per annum), fetched from £7 16s. to £7 17s. 6d. apiece; the purchasers taking the dividend accruing from the 1st of July last. A small parcel of consolidated stock of the Sutton Gas Company, ranking for a standard dividend of 5 per cent. (the last declared having been at the rate of £5 15s. per cent.), was sold at from £116 to £116 10s. per £100, *cum div.* as from the above-named date. Last Thursday, Messrs. Alexander, Daniel, and Co. offered for sale, in accordance with the announcement which appeared in our columns a few weeks ago, £15,000 of 7 per cent. maximum consolidated ordinary stock of the Bristol Water Company. The reserve was £138 per £100; and the whole of the stock was quickly sold at prices ranging from £140 5s. to £141—the average being £140 9s. 3d. The amount realized by the sale was £21,067 10s. At the Castle Hotel, Windsor, Messrs. Buckland and Sons recently offered for sale several lots of gas shares. Some original £20 shares in the Windsor Gas Company realized an average of £43 1s. 6d. each; a few fully paid new £20 shares, £30 each; and similar shares on which only £8 had been called up, £11 5s. each. Original fully paid £15 shares in the Eton Gas Company, upon which the maximum dividend of 10 per cent. has been paid for many years, were eagerly purchased at £29 10s. and £28 17s. 6d. each. A few fully paid £15 "B" shares of the same Company, bearing interest at 7 per cent., realized £19 15s. apiece; and six new "B" shares upon which only £5 had been paid fetched £7 2s. 6d. each.

Gas Shareholder Disqualified as Councillor.—At the meeting of the Padstow Urban District Council last Tuesday, a warm discussion took place as to the qualification of Mr. John Hawken to retain his seat, he being a shareholder in the Gas Company, with whom the Council have a contract. Mr. Hawken maintained that he was not disqualified on this account. Captain C. Rawle strongly held the opposite opinion, and moved that notice be given that Mr. Hawken's seat be declared vacant. The motion was carried.

Behind the Times at Sabden.

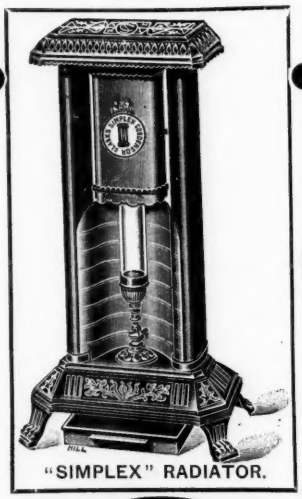
The Padiham Urban District Council having by a recent Parliamentary Bill obtained powers to supply the village of Sabden with gas, steps are being taken to carry out a scheme, which will necessitate the laying of a new main. The gas will be forced over the hill by a system of high pressure, which will be regulated on the Sabden side at the foot of Black Hill. The price of gas to consumers will be at the rate of 4s. 3d. per 1000 cubic feet. At last week's meeting of the Sabden Council, Mr. A. J. Harrison, Gas Manager at Padiham, attended and explained to the members that the action of his Council in the matter would be determined by the extent of the demand for gas; and he thought they would require a minimum demand for the supply of 3 million cubic feet. The Chairman of the Sabden Council (Mr. T. Edmondson) said that as many of the houses were without pipes and fixtures, he anticipated considerable difficulty in getting property owners to agree to the expense that would be necessary. Finally Mr. Harrison was requested to prepare estimates of the cost of pipes and fixtures for the different classes of houses in Sabden—these to be submitted to a meeting of the property owners.

The Rowley Urban District Council have decided to appoint a Committee to consider the question of purchasing the gas undertakings within the Council's district.

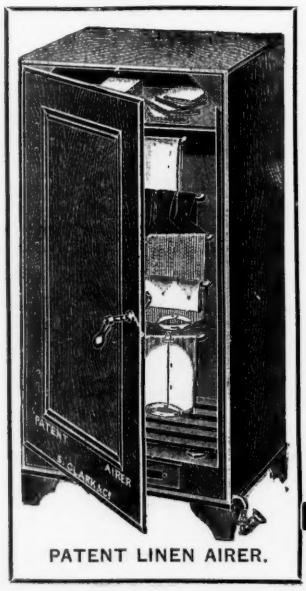
The Directors of Meters Limited have declared interim dividends at the rates of 5½ and 4 per cent. per annum on the preference and ordinary shares respectively, for the half year ending Sept. 30.

The supply of both gas and electricity at Burton-upon-Trent are in the hands of the Corporation; and the Managers of the two undertakings are naturally doing their utmost to make them as profitable as possible. In their efforts to do this, they seek the aid of the local Press. Early last month, the Manager of the electricity works (Mr. P. J. Pringle) endeavoured to convince the readers of the "Burton Daily Mail" that his product was cheaper, better, and healthier than gas, and that a seven-roomed house could be lighted for 19s. 2d. a year. Their attention was called to a circular furnishing estimates for lighting, &c., which was being freely distributed by the Electric Department. Having given electricity an advertisement, the "Mail" could not, in fairness, refuse to do the same for gas. Accordingly, a subsequent issue contained an article testifying to the continued pre-eminence of gas, and advising those interested in obtaining "the most light for the least money" to compare the value obtained from a pennyworth of gas with the claims put forward for other illuminants. Outside the domain of lighting, attention was called to a booklet, entitled "My Darkie Friend," which Mr. R. S. Ramsden has been issuing from the gas-works, in which the utility of gas-stoves in all departments of the household is set forth in a chatty way. Though this has been pointed out again and again, Mr. Ramsden is doing well to reiterate it by the means he has adopted.

A FEW SPECIALTIES FOR THE COMING SEASON



"SIMPLEX" RADIATOR.



PATENT LINEN AIRER.

S. CLARK & Co.,
Compton Works, Canonbury Road,
HIGHBURY, LONDON, N.
Show-Rooms:
58, HOLBORN VIADUCT, E.C.
Telegrams: "Syphon Stoves, London."
Telephone: 1777 North.

New Season's Catalogue Free on Application.

"FAVORITE" BAR STOVE.

The Coke-Oven Construction Company, Limited, has been registered with a capital of £16,000, in £1 shares, to take over the business of contractors for the construction and equipment of coke-ovens and bye-products recovery plants owned by Mr. J. H. Darby, of Sheffield, and to adopt an agreement with him and Messrs. W. Colquhoun and R. Jones.

We have received from Messrs. James Truscott and Son, Limited, a pocket edition of the Architects' Directory, published in the "Architects' Directory and Referendum," a year-book brought out under the editorship of Mr. A. C. Freeman. It has been produced specially for the use of representatives of firms, and the contents are limited to the names and addresses of architects.

According to a special telegram from Berlin to the "Financial News," the Auer Gas-Mantle Company of that city announce a profit of 3,190,000 marks for the last financial year, against 1,056,000 marks for the preceding one. The dividend has been fixed at 35 per cent., against 22 per cent. It is pointed out that the capital has already been increased; and the question is being considered of further augmenting it by the issue of 6,660,000 marks, in 5 per cent. bonds.

In the quarter ending Sept. 30 last, the work of the inspectors engaged in gas-meter testing for the London County Council was as follows: Meters received, 53,498; stamped, 47,074; rejected, 6424; fees received, £1584.

At the meeting of the Barrow Town Council last Tuesday, the Finance Committee informed the members that they had received a writ from Messrs. Kennedy and Co., the Contractors for the Duddon Water-Works, in respect of a claim for between £20,000 and £30,000.

A smell of gas being detected in a Grimsby tea shop, a plumber was sent for. He examined two chandeliers in the rooms above the shop, and decided that there was no leak. He then called the manager upstairs; and to demonstrate that all was safe, he struck a match. An explosion immediately followed; and the manager was blown through the door of the room out on to the landing, while the plumber was almost hurled through the window into the street. The plumber was badly burnt about the face and hands, and was removed to the hospital; but the manager escaped with nothing worse than a shock. The fire brigade were quickly on the scene, and checked the fire before any material damage was done.

"ILLUMINATING TRUTHS."

LEAFLETS FOR DISTRIBUTION.

No. 1.—"The Sanitary Aspects of Gas and Electric Lighting."
No. 2.—"The Cleanliness of Illuminants: The Eyesight."
No. 3.—"Fire Risks."
No. 4.—"The Relative Cost of Gas and Electricity, and Matters affecting it.
No. 5.—"On Reliability, with Instances of Misplaced Confidence."
No. 6.—"On Shop Lighting, with Special Reference to the Flame Arc Lamp."
No. 7.—"The Osram Lamp: Fiction and Fact.

This series of Leaflets will be useful, not only for distribution among Householders generally, but for circulation among Shareholders to fortify them with arguments in defence of the commodity in which they have invested capital. Copies of each Leaflet should also be kept in every Gas Undertaking's Show-Rooms.

Prices for Quantities on Application to WALTER KING, 11, BOLT COURT, FLEET STREET, E.C.

WANTED, FOR SALE, CONTRACT, &c., ADVERTISEMENTS IN THIS WEEK'S "JOURNAL."

Situations Vacant.

MANAGER. Ayr Gas Company. Applications by Nov. 30.
RESEARCH CHEMIST. Leeds University.
DRAUGHTSMAN. No. 5014.
JUNIOR DRAUGHTSMAN, M. H. (METHANE HYDROGEN). Gas-Plant, Limited.

Situation Wanted

SULPHATE OF AMMONIA PLANT PLUMBER. Davies, Shepherd's Bush.

Pupil Wanted. No. 5004.

Capital Wanted.

GAS-WORKS PURCHASING SYNDICATE. No. 5006.

Meeting.

ORIENTAL GAS COMPANY. London Office. Nov. 18. Twelve o'clock.

Plant (Second-Hand) for Sale.

CONVEYORS. No. 5015.

Stocks and Shares.

ALDERSHOT GAS AND WATER COMPANY. Nov. 17.
ALLIANCE AND DUBLIN CONSUMERS' GAS COMPANY. Nov. 17.
BARNET GAS AND WATER COMPANY. Nov. 18.
MAIDSTONE GAS COMPANY. Nov. 12.

TENDERS FOR

Acetylene or Petrol Gas Plant. No. 5011.

Coal and Cannel.

EDINBURGH AND LEITH GAS COMMISSIONERS. Tenders by Nov. 9.

Cresylic Acid. No. 5016.

Fire-Clay Goods.

NELSON GAS DEPARTMENT. Tenders by Nov. 18.

Pipes, &c.

ISLE OF THANET GAS COMPANY. Tenders by Nov. 5.

Pitch.

No. 5013. Tenders by Nov. 5.

GAS COMPANIES' STOCK AND SHARE LIST.

Referred to on p. 328.

Issue.	Share.	When ex-Dividend.	Dividend or Dividend & Bonus.	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment.
£			p.c.				£ s. d.
590,000	10	Oct. 15	10	**Alliance & Dublin 10 p.c.**	17½—18½	..	5 8 1
268,324	10	,,	7	**Do. 7 p.c.**	12½—13½	..	5 3 8
310,000	Stk.	July 15	4	Do. 4 p.c. Deb.	99—102	..	3 18 5
200,000	5	Oct. 29	6½	**Bombay, Ltd.**	5⅝—6⅝	..	5 8 4
40,000	5	,,	6½	**Do. New, £4 paid**	3¾—4¼*	..	6 2 4
50,000	10	Aug. 27	14	**Bourne-mouth Gas and Water** 10 p.c.	29—30	+1	4 13 4
51,810	10	,,	7	**B 7 p.c.**	16½—17	+½	4 2 4
53,200	10	,,	6	**Pref. 6 p.c.**	15½—16½	+½	3 12 9
380,000	Stk.	Aug. 13	12½	**Brentford Consolidated**	244—249	..	5 0 5
300,000	,,	,,	9½	**Do. New**	185—190	+2	5 0 0
50,000	,,	,,	5	**Do. 5 p.c. Pref.**	120—125	..	4 0 0
206,250	,,	June 12	4	**Do. 4 p.c. Deb.**	100—105	..	3 16 2
220,000	Stk.	Sep. 11	10⅝	**Brighton & Hove Orig.**	205—210	..	5 2 4
246,320	,,	,,	7⅝	**Do. A. Ord. Stk.**	150—155	..	5 0 0
450,000	20	Oct. 15	10	**British**	41—42	..	4 15 3
109,000	Stk.	Aug. 27	6	**Bromley, Ord. 5 p.c.**	113—116	..	5 3 5
165,700	,,	,,	4½	**Do. do. 3½ p.c.**	84—86	..	5 4 8
500,000	10	Oct. 15	7	**Buenos Ayres (New) Ltd.**	11—11½	..	6 1 9
250,000	Stk.	June 26	4	**Do. 4 p.c. Deb.**	93—95	..	4 4 3
150,000	20	July 15	7½	**Cagliari, Ltd.**	24½—25½	..	5 13 9
100,000	10	—	—	**Cape Town & Dis., Ltd.**	4—6	..	—
100,000	10	Apl. 26	4½	**Do. 4½ p.c Pref.**	5—7	..	6 8 7
50,000	50	May 2	6	**Do. 6 p.c. 1st Mort.**	48—50	..	6 0 0
100,000	Stk.	June 26	4½	**Do. 4½ p.c. Deb. Stk.**	78—83	..	5 8 5
157,150	Stk.	Aug. 13	5	**Chester 5 p.c. Ord.**	108½—110½	..	4 12 7
1,493,280	Stk.	Aug. 27	5⅛	**Commercial 4 p.c Stk.**	106—111	..	4 13 8
560,000	,,	,,	5	**Do. 3½ p.c. do.**	103—106	..	4 14 4
475,000	,,	June 26	3	**Do. 3 p.c. Deb. Stk.**	82—84	..	3 11 5
800,000	Stk.	June 12	6½	**Continental Union, Ltd.**	108—113	..	5 15 0
200,000	,,	,,	7	**Do. 7 p.c. Pref.**	137—142	..	4 18 7
460,170	Stk.	—	5	**Derby Con. Stk.**	122—124	..	4 0 8
55,000	,,	—	4	**Do. Deb. Stk.**	103—105	..	3 16 2
148,995	,,	Sep. 30	5	**East Hull 5 p.c. Ord.**	97—100	..	5 0 0
486,090	10	July 15	12	**European, Ltd.**	23½—24½	..	5 0 0
354,060	10	,,	12	**Do. £7 10s. paid**	17—18	..	5 2 10
15,182,590	Stk.	Aug. 13	4/10/8	**Gas-light and Coke** 4 p.c. Ord.	97⅜—98½	+⅛	4 12 0
2,600,000	,,	,,	3⅜	**3⅜ p.c. max.**	87—89	..	3 18 8
3,799,735	,,	,,	4	**4 p.c. Con. Pref.**	105—107	..	3 14 9
4,193,975	,,	June 12	3	**3 p.c. Con. Deb.**	85—87	..	3 8 11
258,740	Stk.	Sep. 11	4⅜	**Hastings & St. L. 3½ p.c.**	93—95	..	4 16 11
82,500	,,	,,	6¼	**Do. do. 5 p.c.**	112—115	..	5 8 8
70,000	10	Oct. 15	11	**Hongkong & China, Ltd.**	17¼—18½	..	5 18 11
123,500	Stk.	Sep. 11	6½	**Ilford "A" and "C"**	128—133	..	4 17 9
65,780	,,	,,	5	**Do. "B"**	100—105	..	4 15 3
51,000	,,	June 26	4	**Do. 4 p.c. deb.**	100—105	..	3 16 2
4,940,000	Stk.	May 14	8	**Imperial Continental**	184—186	+⅛	4 6 0
473,600	Stk.	Aug. 13	3½	**Do. 3½ p.c. Deb. Red.**	94—96	..	3 12 11
195,242	Stk.	Aug. 27	6	**Lea Bridge Ord. 5 p.c.**	116—120	..	5 0 0
£			p.c.				£ s. d.
561,000	Stk.	Aug. 27	10	**Liverpool United A**	227—229	..	4 7 4
718,100	,,	,,	7	**Do. B**	166—168	..	4 3 4
306,083	,,	June 26	4	**Do. Deb. Stk.**	104—106	..	3 15 6
75,000	5	June 26	6	**Malta & Medn., Ltd.**	4¼—4⅝	..	6 6 4
560,000	100	Oct. 1	5	**Met. of** 5 p.c. Deb.	100—102	..	4 18 0
250,000	100	,,	4½	**Melbourne** 4½ p.c. Deb.	99—101	..	4 9 1
541,920	20	May 29	3½	**Monte Video, Ltd.**	12—12½	+¼	5 12 0
1,775,892	Stk.	July 30	4/12/6	**Newc'tle & G'tesh'd Con.**	108—109	..	4 4 10
418,460	Stk.	June 26	3½	**Do. 3½ p.c. Deb.**	90—92	..	3 16 1
15,000	10	Aug. 27	10	**North Middlesex 10 p.c.**	19½—20½	..	4 17 6
55,940	10	,,	7	**Do. 7 p.c.**	13—14	..	5 0 0
300,000	Stk.	Apl. 29	8	**Oriental, Ltd.**	140—143	..	5 11 11
60,000	5	Sept. 30	8	**Ottoman, Ltd.**	6—6½	..	6 3 1
31,800	53	Aug. 27	13	**Portsea Island A**	135—140	..	4 18 6
60,000	50	,,	13	**Do. B**	130—135	..	4 16 4
100,000	50	,,	12	**Do. C**	120—125	..	4 16 0
114,800	50	,,	10	**Do. D and E**	100—110	..	4 10 11
398,490	5	Oct. 29	7	**Primitiva Ord.**	5¾—6*	..	5 16 8
796,980	5	July 30	5	**Do. 5 p.c. Pref.**	4⅝—5⅛	..	4 17 7
488,900	100	June 1	4	**Do. 4 p.c. Deb.**	96—98	+1	4 1 8
1,000,000	10	Oct. 15	8	**River Plate Ord.**	13—13⅜	..	5 18 6
312,650	Stk.	June 26	4	**Do. 4 p.c. Deb.**	92—94	..	4 5 1
250,000	10	Sept. 30	8	**San Paulo, Ltd.**	14—14½	..	5 10 4
125,000	50	July 1	5	**Do. 5 p.c. Deb.**	49—51	..	4 18 0
135,000	Stk.	Sept. 11	10	**Sheffield A**	240—242	..	4 2 8
209,984	,,	,,	10	**Do. B**	240—242	..	4 2 8
523,500	,,	,,	10	**Do. C**	240—242	..	4 2 8
70,000	10	Oct. 29	10	**South African**	13—14*	..	7 2 10
6,429,895	Stk.	Aug. 13	5/6/8	**South Met., 4 p.c. Ord.**	120—122	..	4 7 4
1,895,445	,,	July 15	3	**Do. 3 p.c. Deb.**	85—87	+1	3 8 11
209,820	Stk.	Aug. 31	8	**South Shields Con. Stk.**	152—154	..	5 3 10
605,000	Stk.	Aug. 13	5/6/8	**S'th Suburb'n Ord. 5 p.c.**	115—118	..	4 10 4
60,000	,,	,,	5	**Do. 5 p.c. Pref.**	117—122	..	4 2 0
117,058	,,	July 15	5	**Do. 5 p.c. Deb. Stk.**	120—125	..	4 0 0
502,310	Stk.	May 14	5	**Southampton Ord.**	108—113	..	4 8 6
120,000	Stk.	Aug. 13	6¾	**Tottenham and Edmonton** A 5 p.c.	132—137	..	4 18 6
398,940	,,	,,	5¼	**B 3½ p.c.**	105—108	..	4 17 3
149,470	,,	June 26	4	**4 p.c. Deb.**	100—105	..	3 16 2
182,380	10	June 12	8	**Tuscan, Ltd.**	10—10½	..	7 12 4
149,900	10	July 1	5	**Do. 5 p.c. Deb. Red.**	99—101	..	4 19 0
193,742	Stk.	Aug. 27	5	**Tynemouth 5 p.c. max.**	104—106	..	4 14 4
255,636	Stk.	Aug. 27	6½	**Wandsworth and Putney** B 3½ p.c.	125—130	..	5 0 0
79,416	,,	June 26	3	**3 p.c. Deb. Stk.**	73—78	..	3 16 11
845,872	,,	Aug. 27	5⅛	**West Ham 5 p.c. Ord.**	103—106	..	4 16 6
185,000	,,	,,	5	**Do. 5 p.c. Pref.**	118—123	..	4 1 3
228,300	,,	June 26	4	**Do. 4 p.c. Deb. Stk.**	100—105	..	3 16 2

Prices marked * are "Ex div."